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PERSONAL COMPUTING

The Smart House

Cramming For SAT Exams

Better Cash Flow

Managing Athletes

How Much Memory?

Portable Computing

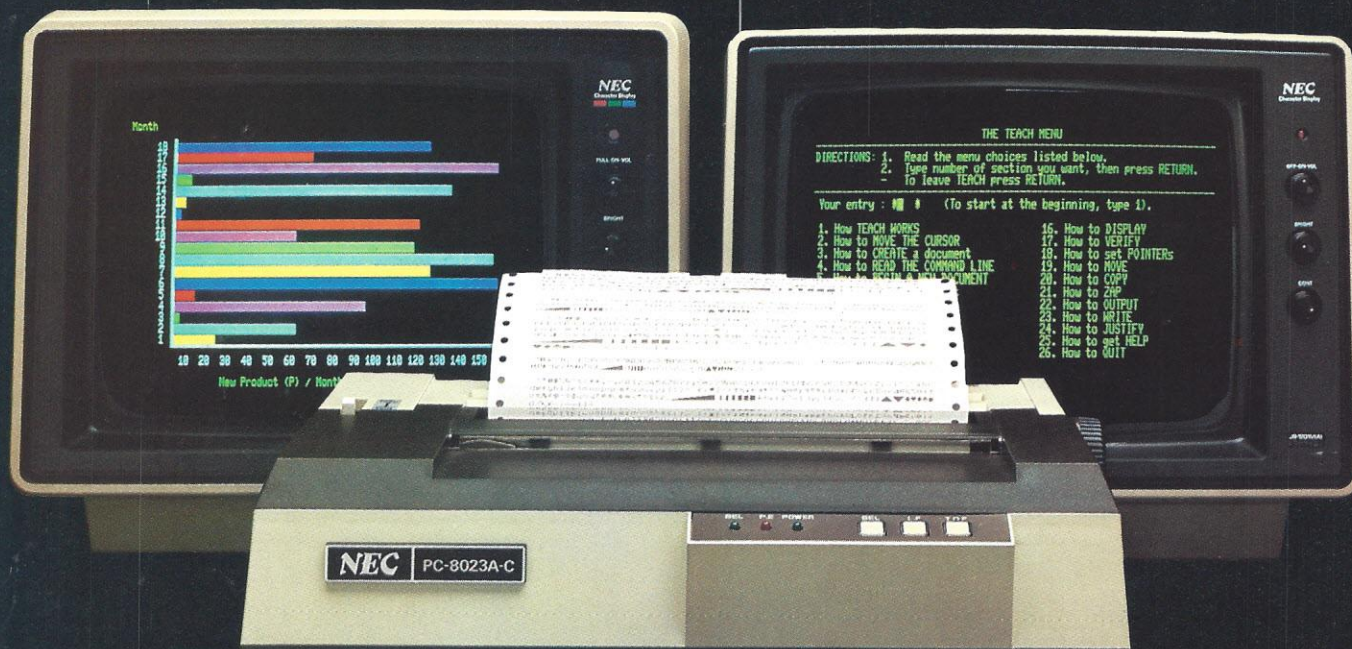
How Much
Should You
Pay For
Your Computer?

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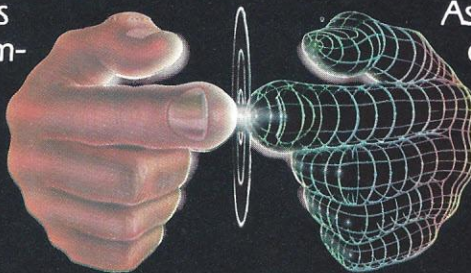
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CIRCLE 2

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PERSONAL COMPUTING

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How much should you pay
for your personal computer?

FEATURES

50 PROFESSIONAL/MANAGERIAL
Could (Should?) An Athlete Be Perfect?

By Jeffrey Rothfeder

Major league baseball teams are using sophisticated player evaluation software to help their athletes achieve perfection. And managers in many businesses might well turn to some of these techniques.

58 PROFESSIONAL/MANAGERIAL
What Should You Pay For Your Computer?

By Jim Powell

The answer isn't a simple one—you must take some factors into account. But the immediate benefits of owning the computer will far outweigh its cost.

69 PROFESSIONAL/MANAGERIAL
Hand-Held Computers: More Than A Curiosity

By Richard Hoffman

They were once thought of as glorified calculators, but hand helds are now taking their place with the giant computers of a few years ago.

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When Personal Computing Becomes Impersonal

By David Gabel

Institutions seem to get in the way of personal activity, and computing is no exception. It can even happen inside companies in the computing industry.

82 BUSINESS
The Small Business Was Under Financial Siege

By Theresa Engstrom

Cash flow was a big problem. This company solved its dilemma with an accounts-receivable package that put cash flow back on the right track.

88 SPECIAL REPORT
More Computer Muscle To Power The Machine

By Lee The

No matter how much memory you have, the day will come when you decide you need more. This report gets you started on the correct use of more memory for extra computing power.

112 HOME
The Smart House Comes Of Age

By Mike Barlow

Architects have had ideas for today's homes that often were beyond the reach of the homeowner. Now the personal computer is changing all that.

121 EDUCATION
SAT Tutoring Programs: Give Them An Incomplete

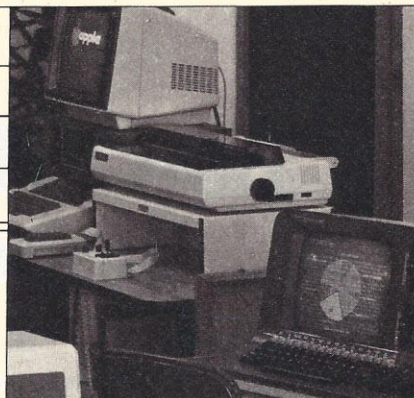
By Tom Cullem

When a test can determine a student's future the way the College Board tests do, cramming can be a real chore. Personal computing is beginning to make that easier, but it's too early to tell what the impact is on test scores.

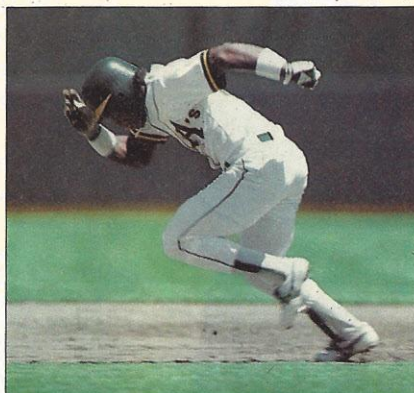
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Programming For The Written Word

By Leon Starr

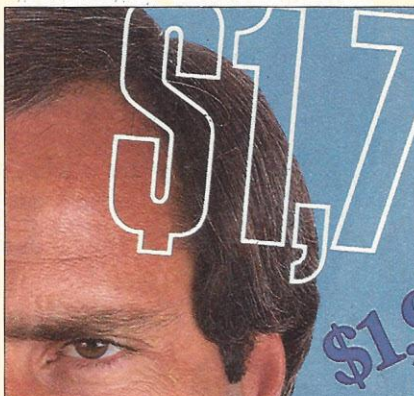
Word processing may be one of the most common computing applications, but our Desk Master programmer found that universality isn't synonymous with simplicity. Word processing turned out to be a tough nut to crack.



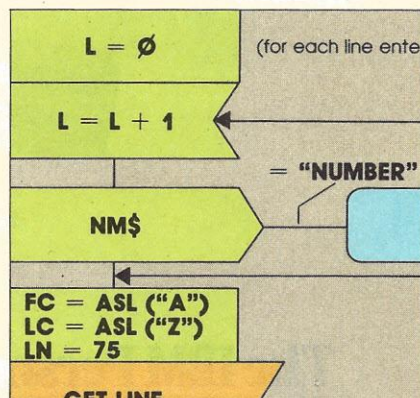
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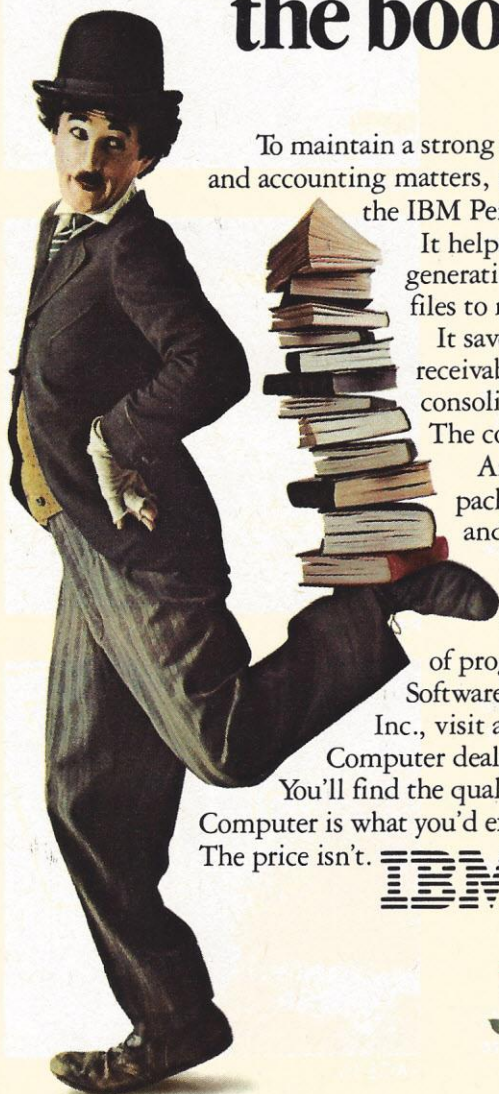


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How to balance the books.



To maintain a strong foothold in financial and accounting matters, a businessperson could use the IBM Personal Computer.

It helps with accounts payable by generating everything from vendor files to month-end credit records.

It saves time on accounts receivable by printing invoices and consolidating multiple transactions. The computer even writes checks.

And it uses general ledger packages that improve control and productivity today, so you won't be off balance tomorrow.

To get an in-depth account of programs from both Peachtree Software Inc. and BPI Systems, Inc., visit an authorized IBM Personal Computer dealer.

You'll find the quality of the IBM Personal Computer is what you'd expect. The price isn't.

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CIRCLE 3

COMING NEXT MONTH

Voice Command

Speak and it computes. That's the promise of the future. Here's a look at the state of the art—what's available now, what's likely to be available when, and what computers that listen will be able to do for you.

Comfortable Computing

Computers extend the human mind, but the body has to fit in, too. We'll share what users have learned—sometimes the hard way—about furniture and workstation configurations.

As Christmas Draws Nigh

Santa might want to think about a super family gift. What are the considerations for the family system—a system for the home? We'll give you some alternatives to ponder, together with some hints to drop in case Santa wants to receive as well as give.

Controlling Payables

When a business (or a family) pays bills too quickly, cash runs short. When payment is too slow, credit is imperiled. Here's how to use personal computing to pay the payables at just the right time.

The Electronic Salesman . . .

. . . May never replace the human huckster, but a personal computer can give a big assist—particularly when the customer must deal with an overload of choices. We'll take you through the development of a selling application that can be adapted to a wide range of situations.

Business Planning Software

Planning means arranging things so that people, work and money flow smoothly and together. Budgeting is the key to planning. We'll describe the systems for "what-iffing" that you might want to plan to use.

If you're looking for a terse dollars and cents figure representing how much to pay for a computer, you won't find it in our cover story, which starts on page 58. The reason is that there is no such figure—no one neat price that's right for everyone, nor even for anyone.

If you're looking for considerations to weigh in order to figure out how much you should pay for your computer, we think we may be of some help.

"How much should I pay?" is a question that we at *Personal Computing* are frequently asked. When we set out to try to answer it we found that the only answer, in essence, was "as much as you want to, but no more than you have to." For an individual, the first part of that answer relates to the checkbook balance. The last part relates to the value put on what you expect the computer to do for you.

As we talked to readers about values and expenditures, it became clear that, almost universally, their expectations were exceeded by whatever computer they chose. No one we ran into felt that he had paid too much. Many wished they had bought more, and planned to buy more.

Nevertheless, there is that practical matter of available resources. We hope "How Much Should You Pay for Your Computer?" will help you bring your resources, your needs and the computer you buy into the same ballpark.

A reader was telling us the other day about the time his printer started eating paper. It would pull a page or two through the tractor feed OK. But then the paper would start inexorably edging leftward as it continued to print. Eventually it would pull the paper out of the tractor-feed holes and then joyously chew the paper up while the printhead deliberately placed lines of copy one on top of another.

Our friend and his printer struggled for hours. He'd carefully realign everything, make sure all the levers and bars were closed properly, refeed the paper into the printer and start it up again. And again, it would pull its Jaws routine. Finally, in despair, he started pouring over the manual, plowing through the cutesey language that so

many in the computing industry think passes for "user friendliness."

Finally our friend noticed a footnote hinting that the platen-release lever has to be open in order for the tractor feed to work. Many printers, his included, pull paper through in one of two ways—friction feed, like a typewriter, and tractor feed. If you try to get the printer to do both at once—which turned out to be the case in this case—the two systems fight, and your print-out is the loser by a knockout.

Our friend now says that although he still will not read the owner's manual for a new car, he will read the manuals for computer equipment. He also says that in the future he will try to figure out what's happening before he tries to fix it.

That leads us to consider sharing some of our own learning experiences—knowledge we didn't particularly want to gain but are glad we did.

And that leads us to invite you to share your own knowledge—whether it has been gained objectively or the hard way—through the pages of *Personal Computing*.

What funny thing happened to you on the way to the disk drive? What tips do you have that someone else could use? What secrets have you uncovered that no one else yet knows? What anecdotes have you to tell that reveal the hidden personalities and quirks behind these things called personal computers?

We'll pay you to share—up to \$25 for up to 250 words, which is about one full page of unchewed printout paper. Send your gems of wisdom to Gems of Wisdom Editor, *Personal Computing*, 50 Essex St., Rochelle Park, NJ 07662.

If you have longer, more significant stories to tell—something that might make a major article—we'd like to hear about those, too. It's best to query, with a brief description. If your story is something we think publishable we'll be eager to work with you to perfect the manuscript. Address your queries to The Editors.



Editor

OsborneTM brings you the comparison IBM[®] and Apple[®] don't want you to see.

Other computer companies dazzle buyers with an array of options and add-ons that makes the final price hard to determine and makes the computer hard to buy, complex to assemble, and very difficult to carry.

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Business BASIC ^E :	INCLUDED	EXTRA COST	EXTRA COST
CP/M [®] Control Program:	INCLUDED	EXTRA COST	F (see below)
Word Processing ^G :	INCLUDED	EXTRA COST	EXTRA COST
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Carrying Case:	INCLUDED	EXTRA COST	EXTRA COST
TOTAL PRICE^I:	\$1795	\$4000-4700	\$4000-4700

A. The Osborne 1TM includes two built-in 100K byte floppy disk drives. The IBM[®] and APPLE II[®] drives provide approximately 160K bytes of storage. **B.** From the IBM Product Center Personal Computer Price Schedule. **C.** From the Apple Computer Suggested Retail Price List. **D.** The Osborne includes MBASIC[®] from Microsoft. **E.** The Osborne includes CBASIC[®], a business-oriented BASIC language from Digital Research. **F.** The Osborne includes CP/M[®], the industry-standard control program from Digital Research. The list of software packages which will run with CP/M is considerable. IBM offers CP/M 86 (a version of CP/M) at extra cost. There are optional hardware systems which allow the Apple II to run CP/M; the Apple II control program is highly comparable to CP/M. **G.** The Osborne includes WORDSTAR[®] word processing with MAILMERGE[®]—products of MicroProTM International. **H.** The Osborne includes SUPERCALCTM, the electronic spreadsheet system from Sorcim Corporation. **I.** Exact price comparisons cannot be presented, because the software and hardware options chosen to create the "equivalent" of the Osborne 1 Personal Business Computer vary in price. The range indicated was computed using price lists from IBM and Apple. Documentation of the computations are available on request from Osborne Computer Corporation. Trademarks: OSBORNE 1: Osborne Computer Corporation; SUPERCALC: Sorcim Corporation; Digital Research: Digital Research, Inc.; Registered Trademarks: WORDSTAR, MAILMERGE: MicroPro International Corporation of San Rafael, CA; MBASIC: Microsoft; CBASIC, CP/M: Digital Research, Inc.; IBM: IBM Corporation; Apple II: Apple Computer Corporation.

Touting The Use Of Terminology

In your article, "Word Processing for Personal Computers," on page 82 of the August 1982 issue, your term "maximum document size" is an excellent way of referring to a very elusive specification of word-processing programs. I was disappointed that I did not see any further reference to the topic.

It would have been most useful to know the maximum document size for the various programs, and also if any of them support any of the many extra memory products on the market.

One approach to increased document size is to automatically access the disk in order to move back and forth in the document. I never thought this was practical with floppy disk drives, but this idea, when combined with a drive simulated in RAM (or a hard disk), becomes very interesting.

David A Werblo
WALNUT CREEK, CA

COMPUTER SOFTWARE THAT HELPS CULTIVATE CROPS

I read with interest George DeVault's article, "Computers Let Farmers Get Back to the Soil," on page 46 of the August 1982 issue. The software mentioned has a great potential for improving farm management.

In addition to the companies listed in the article that offer agricultural soft-

ware, I would like to add the name of Small Business Computer Systems. Located in Lincoln, Neb., our company is marketing an agricultural accounting system that can be used in a variety of agricultural operations with a number of different enterprises.

We seek input from users as to the kinds of software they need for their operations. I would also be happy to speak with groups in the area that are helping farmers to computerize.

Diane Walkowiak
SMALL BUSINESS COMPUTER SYSTEMS
4140 GREENWOOD
LINCOLN, NE

E-MAIL SOFTWARE CONFUSION

Your article, "Electronic Mail Delivers the Executive Message," on page 32 of the June 1982 issue, was slightly incorrect with respect to The BDM Corporation. While it is true that BDM is providing an electronic-mail system under contract to the U.S. Army, this software was not developed from scratch by BDM. The original software was developed by Craig Vaughn of Software Sorcery (McLean, Va.). BDM is modifying this software under license for its particular application.

I would appreciate your bringing this information to your readers' attention.

Kevin W. Apsley
ASSOCIATE STAFF MEMBER
THE BDM CORPORATION
MCLEAN, VA

WHAT YOU CAN DO WHILE THE PRINTER PRINTS

The Outlook section of your August issue contained the article, "Personal Spooling" in which you listed various, print buffers and "spoolers." Technically speaking, "buffers are buffers and spoolers are software." All of the products you listed were hardware buffers, and you neglected to mention Doubletime Printer, which allows the Apple II to print in the background while doing other things in the foreground.

Doubletime Printer is the first general-purpose software package for the Apple II that effectively makes use of interrupts, a feature of mini and mainframe computers. With Doubletime Printer, users may print text, binary text or Applesoft files while they are programming or editing other files. Because Doubletime Printer uses disk files as its buffer, its buffer is effectively unlimited, unlike the 8k to 64k buffers listed in the article.

Among other software packages, PIE Writer word processing and The Correspondent include in their command structures commands to start, stop and restart Doubletime Printer and to create formatted data files. In fact, this letter was composed on PIE Writer while I continued to edit other files.

For users of the Apple II DOS, Doubletime Printer is an attractive, large capacity alternative to any of the other hardware buffers. And it costs only \$150.

Dan Fischer
PROGRAM DIRECTOR
EUPSYCHIA COMMUNICATIONS
AND MANAGEMENT CO.
BERKELEY, CA

SORTING OUT THE DATA BASE DIVERSITY

As one who counts on *Personal Computing* to help me keep current on the computer industry, I was dismayed to see Lockheed Corp.'s DIALOG referred to as dealing primarily with legal issues ("Data Bases Fulfill Needs On Demand," July 1982, page 32).

The DIALOG system has one of the most diverse offerings around, as a glance at the systems catalog would confirm. Two other systems (SDC and BRS) that offer a wide range of data bases weren't even mentioned.

S.C. Rainey
UNIVERSITY OF CALIFORNIA, BERKELEY
DEPARTMENT OF GEOGRAPHY
BERKELEY, CA

I read with interest your very informative primer on data bases, "Data Bases Fulfill Needs On Demand," on page 32 of the

"Hayden's *Personal Computing* magazine's accuracy policy: to make diligent efforts to insure the accuracy of editorial material. To publish prompt corrections whenever inaccuracies are brought to our attention. Corrections appear in 'Letters.' To encourage our readers as responsible members of our business community to report to us misleading or fraudulent advertising. To refuse any advertisement deemed to be misleading or fraudulent."

July 1982 issue. However, I feel I should offer some clarification on how Bob Bone gets his travel articles into our DEC 1170 system from his Xerox 820 in Honolulu.

The mechanics of it have nothing to do, per se, with a Texas Instruments terminal, as Bone suggests in his quotes in the article. Rather, he simply dials up the same remote entry telephone number that our reporters at city hall, the county courthouse, or on the road with local sports teams call when they are ready to transmit stories they have created on our TI 765 devices. We have been using some 30 TI 765 portable terminals for four years, which might have caused this confusion.

But Bone was certainly correct when he said that editors like this kind of on-line delivery of copy. Of course, it's not as much fun as in the old days when a reporter with a hot story called up the city room and yelled, "Hello sweetheart! Gimme a rewrite!" But it is vastly more efficient and, perhaps, a little less sexist.

We have programmed our TIs and four recently purchased Teleram Portabubble/81 remote entry terminals in accordance with American Newspaper Publishers Assn. (ANPA) standards, which were originally developed for the major wire services. Thus, local copy from outside the office comes into the systems with the same standard wire service header, including a keyword, priority code and category code, as is used by both the Associated Press and United Press International. The only difference is that this local copy comes in over a dial-up line at 300 baud, while AP and UPI come in at 1200 baud through two other separate ports in the computer—AP via a satellite dish behind our building, and UPI via dedicated AT&T lines.

Generally speaking, any newspaper with an editorial front-end system can receive copy from virtually any of the personal computers on the market that output ASCII and can be hooked up to a modem. Once we get the communications parameters set up and the protocols matched up with the wire-stripping algorithms in our DEC TMS-11 software programs, we can input. The system is configured so that nobody, not even our own reporters, can access our data base through this very narrow input window.

Bone was also incorrect in his description of his problem with "the traditional

journalist's paragraph symbol." That's not what his problem is at all; his problem concerns what's known in typesetting circles as a "quad left" command—a combination of a 1 and a carriage return, which is also known as a linefeed/carriage return. These often show up in random places in stories from some remote entry machines, apparently because the sending machine's end-of-line (EOL) transmission sequence is in the "in" mode rather than the "out" mode. For example, our wire-stripping program deletes all end-of-line hyphens and all line terminators. If a line ends with a space but does not begin with a space, a quad left is appended to it. The converse works the same way.

None of this is apparent to the sender. But, in any case, it's not a big problem for us. I have programmed a UDK (User Definable Key) on our editing terminals that automatically loops through the entire file looking for, and deleting, these unwanted quad lefts.

Richard T. Sullivan
ASSISTANT NEWS EDITOR, SYSTEMS PLANNING
SAN DIEGO TRIBUNE
SAN DIEGO, CA

A CALL FOR "BIG BLUE" SOFTWARE

I have an IBM Personal Computer and a fully configured PRISM 132 printer, and I continue to be fascinated by the myriad software ads I see in all of the computer magazines each month. However, most of the really fun programs—be they games, music synthesizers or graphics aids—seem to be aimed at owners of Apples or TRS-80s. Some of the problems (I am told) are due to the newness of the IBM as well as its non-standard 8088 micro-processor and lack of a "standard" operating system.

This letter is to urge all of you to work on powerful, user-friendly software capable of using the IBM for music and color, rather than sticking to "plain vanilla" business applications. I would like to see the IBM DOS—in either the DOS version 1.05 or the soon to be released DOS 2.0—become the standard operating system for the IBM.

There is a real market for software that will allow IBM users to make full use of the system, as well as all the nifty features of a fully configured PRISM

printer, without resorting to awkward "home-made" utility programs written in BASIC. I am starving for good software, and I know there are many other people in the same situation. There is some kind of myth floating around that the IBM machines are bought only by corporations for business use. My machine is owned by my corporation but I really bought it for me.

I suspect that lots of IBM owners are in similar boats. We really are a bunch of hobbyists who want all the games, graphics and music abilities that Apple and TRS-80 owners enjoy. Please don't let us down.

Bill Siebert
PRESIDENT BOLESKINE HOUSE, INC.
SPENCER, NY

IT'S WORTH A THOUSAND WORDS

Standard & Poor's provides a valuable information service built upon a tremendous base. While it is possible that somewhere at Standard & Poor's performance statistics on the Boston Red Sox might exist, the graphics used in your article, "Picture This—And Do It Yourself," on page 50 of the August issue, were not provided by them.

The graphics were, in fact, created by Business & Professional Software, Inc. (BPS), developers of such personal-computer business graphics packages as Apple Business Graphics and Screen Director. The charts of Red Sox performance are part of a demonstration package for Apple Business Graphics and PIK, its Printer/Plotter Installation Kit. PIK was also developed by BPS.

Sam Guckenheimer
DIRECTOR OF MARKETING
BUSINESS & PROFESSIONAL SOFTWARE, INC.
CAMBRIDGE, MA

THE "REAL CRISIS" IN EDUCATION

As a very recent subscriber to *Personal Computing* and a relative newcomer to the field of personal computing, I have read all of your recent (March-August) issues with the eager dedication of a new convert. Your August issue contained an article which sparked my interest most particularly.

As a retired educator, with 34 years as
(continued on page 169)

As IBM would design it

**The Personal Hard Disk™ from Corona™.
Only for the IBM Personal Computer.**

Corona specialization makes the difference:

It fits right in—right inside the IBM Personal Computer, with no external power supply.

And it makes friends fast—with self-documenting, menu-driven, very “user-friendly” software.

It responds to your needs—for multiple operating systems on the same disk at the same time, in flexible partitions that grow as needed.

It backs you up—on floppies, using “selective” backup (by date, by volume, by category), so an additional backup device is not needed.

And it has reliability you can count on—combining exclusive use of Seagate drives with Corona's DataGuard™ and FailSafe™.



And the price?

\$1995 for 5 MB,

\$2495 for 10 MB

Experience the difference specialization makes.

Ask your dealer to show you the Corona Personal Hard Disk (or call us for dealership and quantity purchase information).

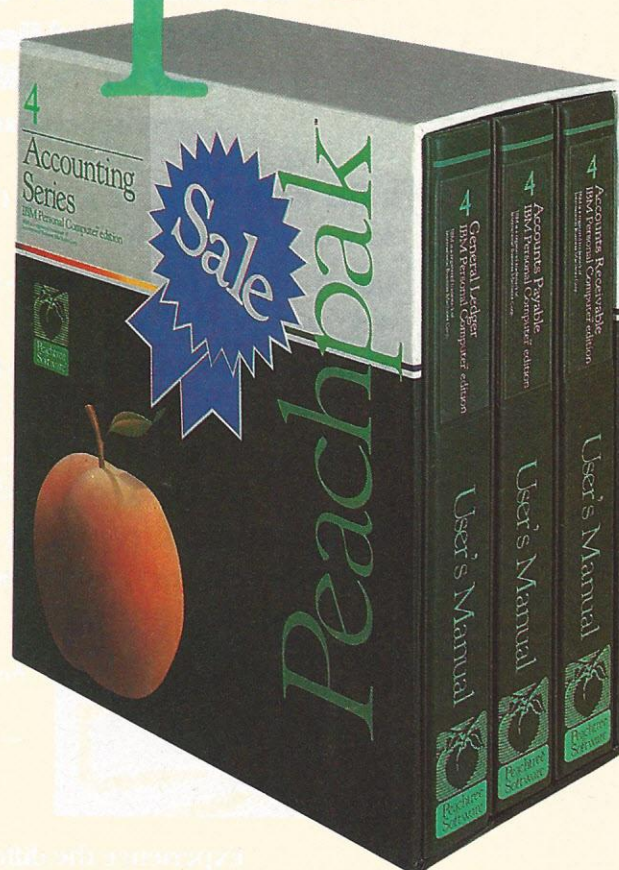
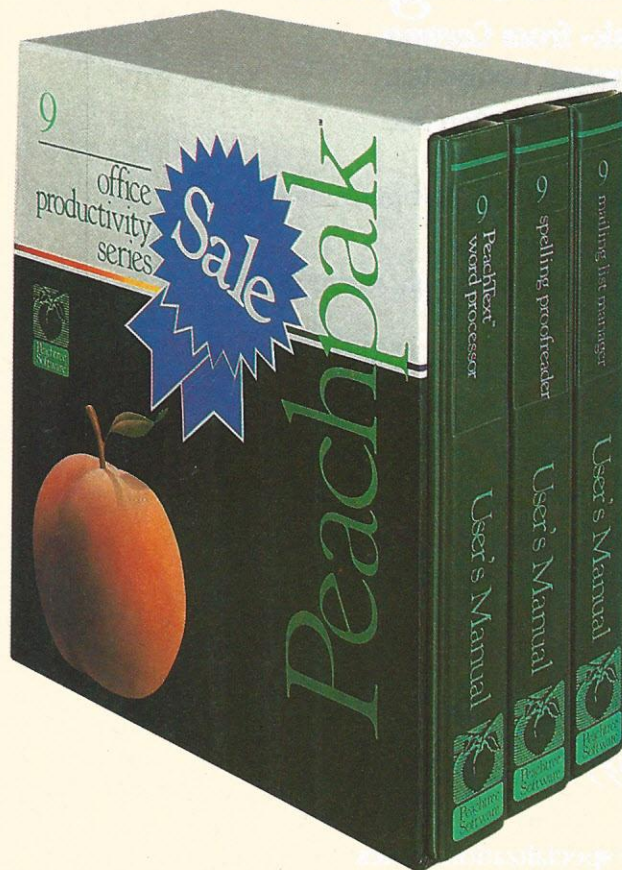


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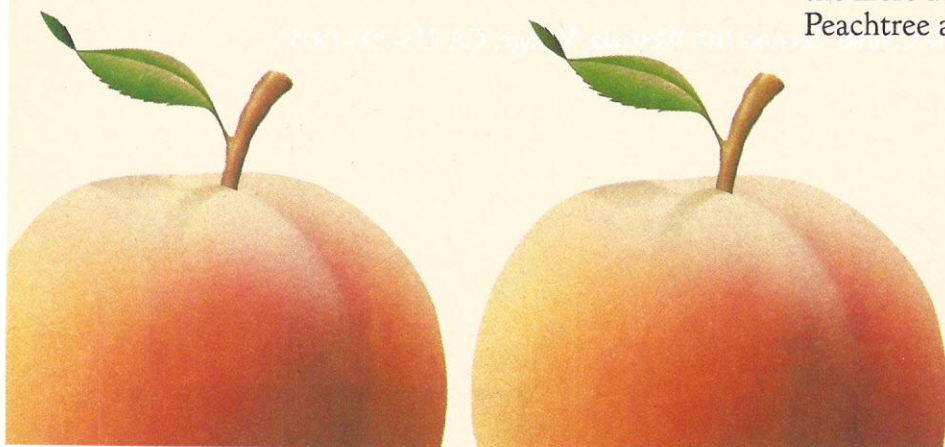


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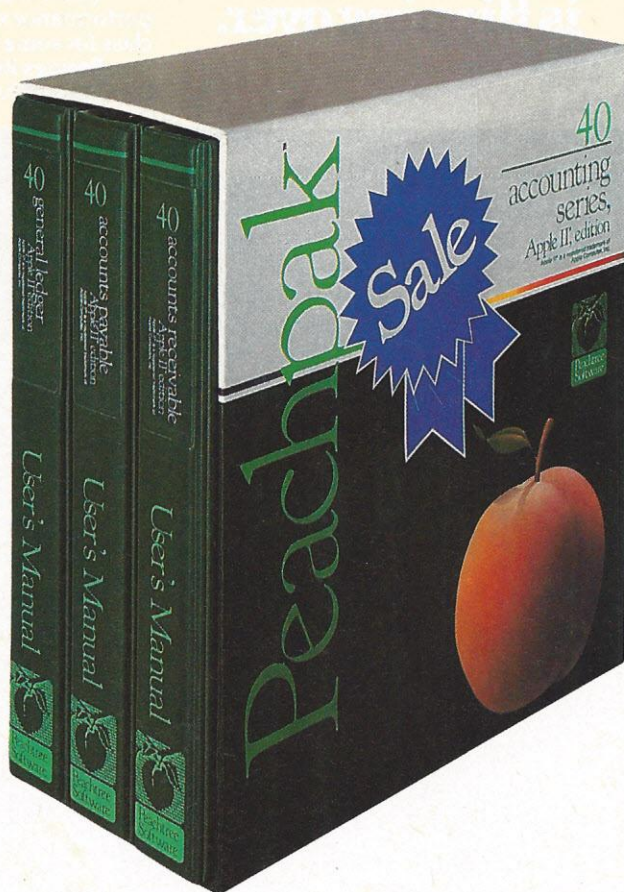
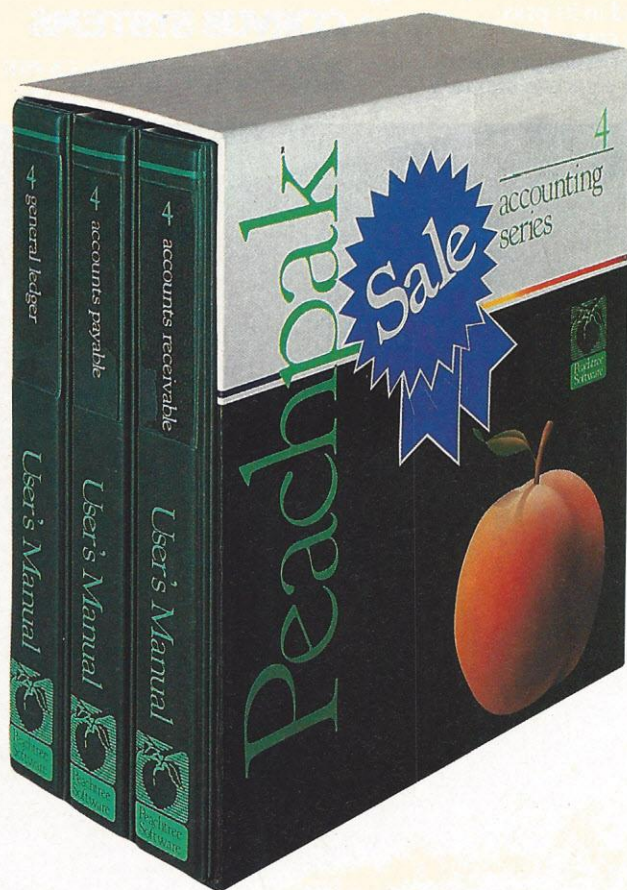
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Good Reasons For Two Kinds Of Data Storage

In this monthly column, "Answers," we will respond to your most frequently asked general questions about personal computing. Please send your questions to: Answers, Personal Computing, 50 Essex St., Rochelle Park, NJ 07662.

Q. I'm thinking of getting a hard disk drive. I hear I'll still need a floppy drive. Why?

A. There are three reasons. One: you need some way to load programs into your computer. Two: you need some way to back up data. Three: you need another drive so you can keep going when your hard disk needs repair.

Loading programs is commonly done from 5¼-inch or 8-inch floppy disks. There are other media on which programs can be stored. New disk formats are coming, for instance, and there are tape cassettes. But most of the software is loaded from disk.

One thing that limits hard-disk implementation is software copy protection. You have to sympathize with software firms trying to protect their products from theft by duplication. But they protect the product so well that you often can't install protected programs onto hard disk. Besides, it may not be legal to do so. So you need to search for unprotected software to use, or put up with booting programs from your floppy disk drive while you wait for the industry to solve the software-piracy problem. A good programmer can help you put a protected program onto hard disk—and as long as you bought the program fair and square and aren't copying it for others to use, you may retain support from the maker. But

you can't count on it. Check before you go the programmer-installation route. Vendor software support is truly mandatory.

As for backing up data, just ask yourself, "What would happen if all my data on this hard disk were lost at any given instant?" The ideal backup is a removable hard disk. Such devices are being made, but they're not available to consumers yet. You can back up a hard disk with another just like the first. But since hard disks used in personal computing are non-removable, you're stuck when you reach the limits of the disks. So you need a different form of backup—tape, floppy or removable hard disk. Since you need a floppy drive anyway for program input, using it for backup is about the simplest solution. The disadvantage is in the number of floppy disks you'll need. If you have an Apple II Plus that runs standard single-density floppy disk drives, for instance, that's 35 floppy disks per hard disk. Other large, high-density disks could need as few as five 8-inch floppies to back up a 5-Mbyte hard disk.

Lastly, you need backup for continuous operations. The hard disks haven't really been around in general use long enough to establish their reliability in personal-computing applications. But, from engineering calculations, they are known to be very reliable—more reliable than are the older removable hard-disk packs or floppy disks. A Winchester disk, which is the kind used for personal computers, is an incredibly precise device, so it makes sense to assume that it will break down at one time or another—undoubtedly just when you

need it most. That floppy drive you didn't want will be invaluable then. Slow go is better than no go at all.

Q. What does it mean to "boot" a computer? And what is the difference between a "warm boot" and a "cold boot"?

A. "Boot" is short for bootstrap. It comes from the old expression, "Pulling yourself up by your bootstraps." To boot is to load the software of your choice into your computer's active memory. You might call it a program-starting program. "Cold" and "warm" refer to whether you start up the program you want with the machine off or on.

An Apple II Plus' bootstrap loader searches for a program to load when you turn the computer on, for instance. It looks for the program in the drive connected to the drive #1 position on the disk-controller card inserted in slot #6. Finding the application program in the drive, the bootstrap program loads it into memory and begins execution. In this case, the system has been booted with a cold boot.

By contrast, suppose the computer is on and you've been working with one program, then quit that program to run another. You put a program-laden diskette into your drive and type PR#6. That command instructs the machine to boot whatever you put in drive #1 on the controller card in slot #6. In that case, the system has been warm booted.

Many other computers, including older Apples, don't automatically try to boot what's in the disk drive when the system is turned on. On an older Apple you might get a screenful of

visual garbage and have to give the machine a two-key command to get it into position to warm boot the program. Depending on the program being booted, another step or two might be required. However many preliminary steps the machine requires, the computer twirls the disk drive and reads the program off the disk and into its active memory. Then it either starts running the program or waits for a run instruction.

Q: I currently have a 64k Inter-tec Superbrain with CP/M version 3.0. I'd like to play some games, but they only seem available for the Apple or Radio Shack computers. Is there any game software available for CP/M users?

A: Yes, but if you want information about how and where to get it, that's another story.

CP/M, as you probably know, is a de-facto standard operating system for small computers, but it has mostly business applications running under it. There are a lot of reasons why this is so—most of them marketing considerations.

Not too many years ago companies offering game software somehow got labeled as hobby-software companies. Those who did this kind of labeling began to equate business software with virtue, and game software with sloth and indolence. So companies that wanted to be thought of as serious began to develop software for business to run under CP/M. Demand for good business software is so great that successful business-software companies often found that that was all they could do. They couldn't have broken out of that and into games even if they wanted to. Although it's a sure bet that programmers in such companies create games for their own amusement, they just don't have the time to develop them for the market.

Companies that do produce game software found something of the same time bind operating on them.

They didn't take the time to develop games for CP/M systems simply because of the demand for games on computers that don't use CP/M. To branch out to CP/M would require their programmers to learn a new operating system. Also, authors who write games on a free-lance basis and then get them published by some software publisher have no incentive to write for a CP/M system, since their programs for other systems readily get published.

Nevertheless, there is game software for CP/M systems. We dimly recall hearing about some several months ago. Unfortunately, a diligent search failed to turn up any relevant information. That's not a satisfactory answer to your question, but we'll keep looking. As we find examples, we'll bring them to your attention. Can anyone out there help?

Q: Lexisoft advertised boilerplate features for its word processor in your magazine. Is this the same thing as a steno key?

A: While we're not really sure what a steno key is, we can explain boilerplate features.

If you have some words, phrases, sentences, etc., that have to appear in many documents, or in many places in the same document, those words, etc., are often called boilerplate. Boilerplate features merely allow the user to deal with boilerplate in a convenient fashion. Usually it can be assigned to a reserved location in a text buffer, and then called and inserted into the document with the use of one or, at worst, a few keystrokes.

Such capabilities are particularly useful for traditional professionals—lawyers, accountants and the like—who produce many documents whose basic nature is identical, but who must customize a particular document for particular clients. These documents can be assembled quickly and easily using boilerplate features.

We should point out that just because a word processor doesn't seem

to handle boilerplate in a convenient fashion, that doesn't mean it won't handle it at all. One thing users find quickly is that many programs can do almost unbelievable things if the user employs enough initiative. Thus you might be able to get boilerplate capability by cleverly merging text files from a disk, for example, and assembling the final document from the merged files.

Q: Your word-processing special report talked about user-definable keys. What are they?

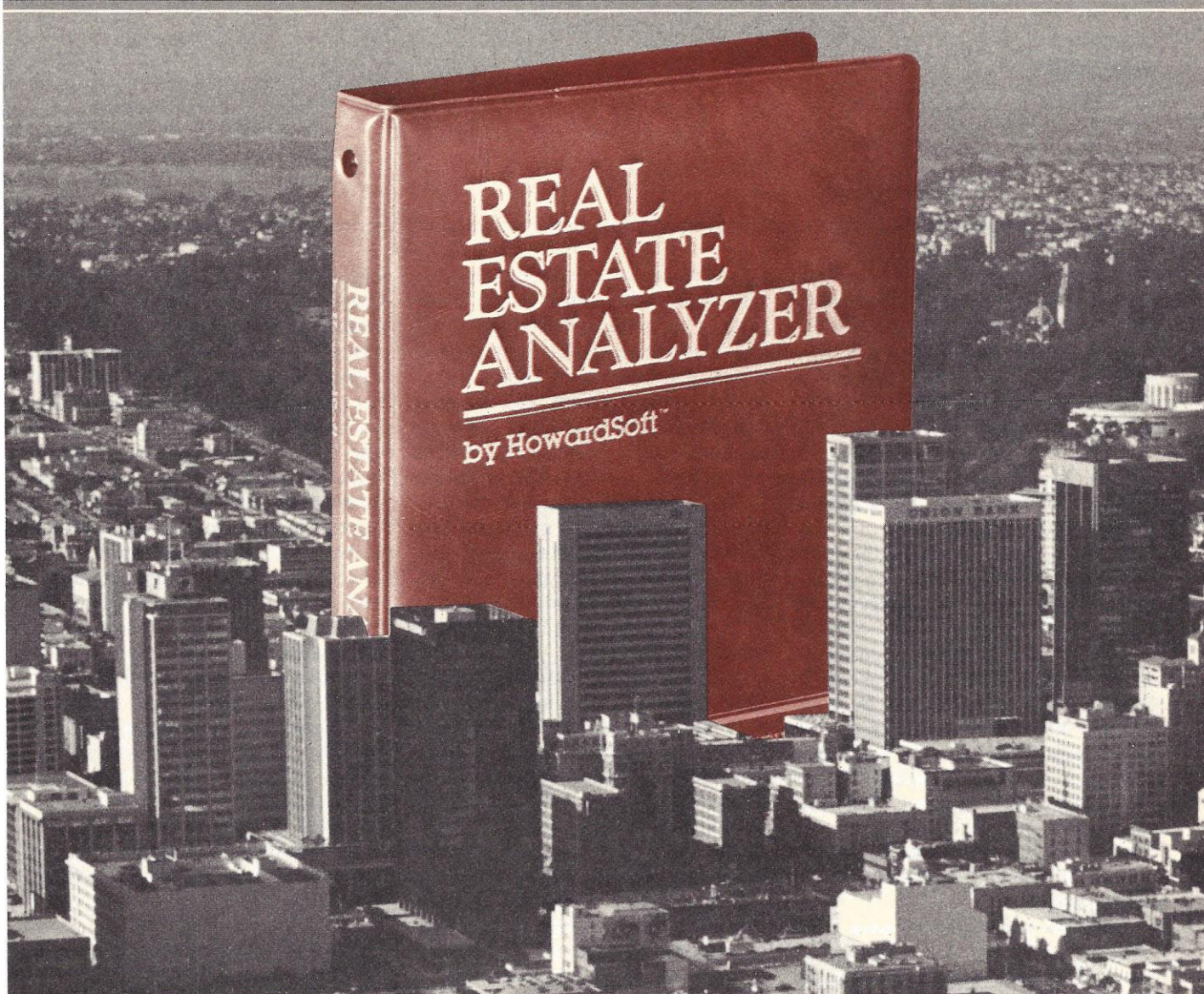
A: User-definable keys can be a lot of things. Generically, a user-definable key is one whose function can change depending on the whim of the user. You might want to have one keystroke provide you with a disk catalog, for example. That function could be defined onto one user-definable key.

These are also called soft keys because the user defining takes place in software, as opposed to hardware. Some computers have separate keys that can be defined, and software to define them resides in those computers' operating systems. The HP-250 is an example of such a machine—its user-definable keys are arranged around the lower edge of the display.

Other computers, like most of the personal computers, have no such separate keys. The fewer the keys, the lower the cost. So if user-programmable keys are to be provided on a personal computer, they have to be defined in the software for keys on the regular keyboard, or else you need to buy an add-on device. Such a device is available from Videx for the Apple II. The Function Strip acts in concert with the Keyboard Enhancer to allow you to define characters, sequences of characters, or commands or sequences thereof, and store them in a buffer, from whence they can be recalled by pushing one key on the function strip. The combination of the two products retails at \$215.

Some software allows you to define

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function keys. Other software doesn't. There are arguments pro and con about the efficiency of such keys. You're best off to check for yourself and find out if you really need them before you start a search for the ability to define key functions.

Q: My printer comes with a three-foot cable, but I need a longer one. Can I get one?

A: Printers are connected to computers with one of two different kinds of interfaces, either parallel or serial. Connections to parallel interfaces are generally limited to six-foot to ten-foot runs, and can be bought from, or made up by your dealer. You can make your own if you know which wire in the cable connects to which function. Serial connections could go up to 500 feet, depending on how they're routed, and could require some expensive modifications to the printer and/or the computer.

Parallel transmission uses plus five-volt and zero-volt levels to signify the binary numbers (strings of 0s and 1s) that computer systems talk with. That means you have a five-volt difference between the two things you can say, out of which anything you'd want to print is constructed. Serial transmission, using what's known as the RS-232-C protocol, so called by the Electronic Industries Association (EIA), can handle much longer runs because it uses two signals which differ by 50 volts instead of five. So, roughly speaking, serial transmission is 10 times stronger than parallel transmission. That means serial transmission can go farther than parallel transmission.

That's because the lower voltages can't push through a very long cable without becoming attenuated. A parallel design sends signals back and forth through the cable based on a certain timing. Longer runs throw the timing off, causing errors. Information transmissions based on voltage differences are subject to in-

ducted noise that can garble the data. The weaker the signal is, the more subject to noise interference it is. Electronic noise can come from the telephone, fluorescent lights, typewriters, tape recorders, the computer's power supply and other electronic equipment, especially that which contains transformers. The magnetic fields associated with such devices can electrically affect something the device isn't physically touching. It's good practice to route printer cables as far away from these noise sources as possible, whatever the length of the cable.

You can employ cable shielding to keep noise out, and heavier-gauge wire reduces attenuation. But you may have trouble finding a long, shielded, heavy-gauge cable with the connectors you need at each end. A dealer might be able to make you one (often for disheartening sums) embodying a number of these qualities.

Epson, which makes the MX-80 and 100 printers, provides a three-foot shielded cable to connect its printers to industry-standard parallel interface cards. If you want to use one with an RS-232-C port you have to buy a \$150 serial adaptor card, then take a screwdriver and 10 minutes to install it in the Epson, or have the dealer do it.

Another kind of interface, called a current loop, is good for up to a mile. But you'll have a tough time getting one; they're becoming quite rare. They are the Teletype standard.

Q: I've heard that smoking is bad for computers. Is this true?

A: Yes. It hurts their disk drives. Cigarette smoke contains a mixture of gases and ash. Ash can gum up and abrade the read/write heads in the drives and the surfaces of the diskettes, along with the pressure pads that push the disk surface against the read/write head in a floppy drive. That's especially important if you use double-sided diskettes or if you use both sides of your diskettes in

single-sided drives, as you can with Omni Flip/Floppy diskettes. It's especially important with high-density drives with more than 200 kbytes of storage on a 5¼-inch diskette. Just a few ground-in errors could ruin both the diskette and its data. Ash can also coat the printed-circuit boards inside the computer, and sometimes connect two close-together wires that weren't meant to be connected—perhaps with spectacular results. The silicon chips your computer thinks with do badly when overheated, and a thick layer of dust and ash can inhibit the cooling they need.

Smoke contains "particulates," which you can think of as free-form sandpaper where disk drives are concerned. Computer users who smoke should clean their drives often and pay attention to room ventilation.

Sealed disk drives (as are most hard disks) aren't as badly affected by smokers, since the air inside them is filtered.

Q: Can I use my typewriter as a computer printer?

A: Maybe. You can plug it in or plo p it on if your typewriter's keyboard layout looks like an IBM Selectric's. You may be able to install an interface card inside many of the new electronic typewriters (such as those made by Olivetti, Adler, IBM and Olympia), which lets you plug them into an RS-232-C port. With the older electromechanical typewriters it's more of a problem. Kits have been made to convert them in the past, but they all cost upwards of \$600. Since you can now buy a letter-quality printer, like the Smith-Corona TP-1, for a little more, it becomes a questionable purchase. Hollander Office Products of Thousand Oaks, Calif., is now importing the Tyrop—a device that fits over a Selectric-style keyboard and hits the keys with little plungers, one for each key. If your typewriter's keyboard is compatible and \$695 is acceptable,

(continued on page 176)



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Sith Lord and Starbase 12 are the creations of Anthony Targonski of Cambridge, Mass. In fact, Targonski is Sith Lord and Starbase 12 is an electronic bulletin board that he created on his Atari 800. "I'm not only a major computer fan but a science-fiction fan as well," says Targonski. "I wasn't satisfied with the science-fiction coverage on CompuServe and The Source. I also knew that non-computing science-fiction fans had a very

chines, or respond to the columns and editorials.

Targonski expects a tremendous response to his latest editorial concerning rumors about the *Star Wars* movie series. He explains that the latest *Star Wars* movie, *Revenge of the Jedi*, supposedly the last film of the first trilogy, has just completed filming in Yuma, Ariz. It has been rumored that the next trilogy will start with Darth Vader and Obi-Wan Kanobi as young men. Consequently, all of the cast members that have been so popular with movie-goers up until now will be let go. Because of the popularity of these original cast members, other rumors have been circulated that there is a chance that they will be retained and the original plans will be changed.

"Passengers are invited to give their proverbial 'two cents worth' opinion in the public message section on any of the columns that we have, any of the editorials, any of the news or review columns," says Targonski. "It's their chance to comment on the review that we have, to give their own review of something, to give a bit of science-fiction news that they have, or to respond to some of the things that we are tossing out our opinions on."

Targonski runs the bulletin board out of his home using a multidrive Atari 800 with 48k of RAM. The system is paid for directly out of Targonski's own pocket from revenues he receives from some software he has written for the Atari. There is no charge to users.

The bulletin board program is a hybrid of a variety of data-base management programs that run on the Atari. It is written entirely in BASIC because the bulletin board's support base is not limited to Atari users—they are probably only 10 or 15 percent of the passengers. "We have had everything from people calling on Apples to people calling from mainframes," Targonski says. And the user base is running into the hundreds from all over the country—New England to Hawaii.

The hours of the bulletin board are Monday through Saturday, 5 p.m. to midnight, and Sundays, 2 p.m. to midnight (that's Eastern time). Targonski hopes to have a 24-hour schedule in the near future. To beam aboard Starbase 12 call (617) 876-4885.



A bona fide science-fiction fan, Anthony Targonski (Sith Lord) awaits another passenger on his bulletin board, Starbase 12.

nice information network in printed matter with things called fanzines (fan-produced magazines), so I came up with the idea of creating a video magazine."

Starbase 12, according to Targonski, is best likened to a science-fiction information service. There are six rotating articles covering the latest science-fiction film and television news, news of the industry in general, commentaries and trivia quizzes. The data base also features an interactive mode in which users, or "passengers," can "talk" to Sith Lord via the keyboards of their own ma-

THE COMPUTER FRINGE BENEFIT

Chase Econometrics/Interactive Data Corp. recently sponsored a program that allowed its employees to lease or purchase an IBM Personal Computer for about half the retail price. The company, engaged in the imple-

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mentation and operation of decision-support systems, felt that this effort would make its employees more familiar with sophisticated personal computers and their business applications.

The company felt that the program was indicative of the growing trend of using personal computers for management applications, rather than relying on mainframe computers and data processing departments. "Because we're in the computer services industry, it's important that our employees be well-versed in the latest technology," says Carl Wolf, president of the firm. "The better our employees understand personal-computer technology, the better they'll be able to address our clients' needs."

Any employee who purchased a computer outright was reimbursed for about half the system's purchase price. Thus, for a system complete with peripherals such as a printer and monitor, an employee paid about \$3300. The maximum cost to the company was \$5500 for each system. (The list price for the IBM Personal Computer, without peripherals, is \$3615.)

If an employee chose to lease the computer, it cost him approximately \$100 per month, based on a 36-month lease. After that time, he would own the machine.

The employee could choose from a variety of computer configurations, but in addition to the basic computer, the company recommended a modem, a letter-quality printer and a color monitor. Software was also available from MicroSoft of Bellevue, Wash. Some programs including Pascal, FORTRAN, WordStar and SpellStar were also available.

The memo announcing the offer was distributed to the company's employees in May, and sign-up was slated for two weeks later. The computers were gone in about a week, and everyone who wanted a computer got one. The company has not yet decided if it is going to continue the offer to its employees.

NEW CABLE TV LINEUP FOR '83: ARCADE GAMES

Since the introduction of such video games as Pac Man and Space Invaders, Americans have invested millions of dollars in quarters at games arcades. Indeed, some declare, serious tensions result in games addicts who are stuck at home for one reason or another and cannot get to a games arcade. Coming to their rescue in mid-1983 is a new 24-hour video-games channel for cable TV. It will be called The Games Network.

The network is a joint venture of International Cable Casting Inc. and the Westwood Group. For an installation fee of approximately \$40 and \$14 a month, the local cable operator will come to your home and install a cigar box sized microprocessor and a 24-key keypad with options for joysticks and paddles.

Twenty games will be offered each month, which the

user can play for an unlimited time with no more worry that the 90 seconds is almost up. The network will monitor the game playing to determine which games are most popular. The top 15 in the survey will remain on the network for the next month and the bottom five will be replaced with five new games. This adds up to approximately 60 games a year. Subscribers will also receive a magazine describing what the channel is offering that month.

Approximately 300 games have been chosen for the network from companies across the country. Games will cover fantasy, space adventure, role playing, logic, education and other themes.

When cable goes two-way (most systems are now operating one way only), the network will be able to record all



The Games Network, a 24-hour video games channel on cable TV, will offer a variety of games including fantasy, space adventure, role playing and logic.

scores and give away prizes for the highest tally in an area. Users will also be able to play a game with a friend over the telephone lines. "Two-way is the wave of the future," says Jim Summers, director of acquisitions for The Games Network. "The possibilities are limitless."

The Games Network is currently testing its welcome in Fullerton, Calif., where a 90-day trial started September 15. Of 500 homes surveyed for the initial test, 100 are actually participating.

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Network officials have established that an interest in the service exists. Surveys by Cable Marketing in different cities across the country have shown a low interest ratio of 24 percent and a high ratio of 60 percent. These figures are exciting to cable operators because the people surveyed are currently not on any type of cable service but are in areas where cable is available.

"Because of the response we are currently getting from the major cable companies, as well as the smaller ones, we feel very confident that the service will be readily accepted," says Summers. "It is a nice way to increase their subscriber base."

Companies tentatively scheduled for the Fullerton test are: Datamost Software, Chatsworth, Calif.; Sentient, Aspen, Colo.; Avante Garde Creations, Eugene, Ore.; Phoenix Software, Lake Zurich, Ill.; Hayden Software, Lowell, Mass.; Edutek, Palo Alto, Calif.; Broderbund Software, San Rafael, Calif.; Cavalier Computers, Del Mar, Calif.; Computer Programs Unlimited, Everett, Wash.; and Innovative Design Software, Las Cruces, N.M.

Down the line, ICCI is planning to offer other cable channels, including the IQ Channel and the Adventure Channel.

For more information on the Games Network contact International Cable Casting Inc., 937 Lucerne, Los Angeles, CA 90005.

GREYHOUND PUTS A COMPUTER IN THE DRIVER'S SEAT

When the Greyhound bus station in Santa Ana, Calif., put a new station agent in its corporate driver's seat, customer service improved, ticket sales almost doubled in one month, and overhead operating costs were reduced. The agent, Ernie Gonzalez, attributes part of his success to an Altos ACS/8000 computer and software developed specifically for the busing industry.

"When I took over the agency in January 1981, I was willing to leave the driving to the bus drivers," says Gonzalez. "But I wasn't willing to leave fares and scheduling in the hands of operators who were being swamped with as many as 1000 phone calls a day. I decided that a computer system would not only improve service, but would create a more pleasant working situation for employees."

Gonzalez found that making the decision to buy a computer to solve his problems and actually selecting a computer and the software to do the job were two totally different things. "I was overwhelmed by what was available on the market," he says. "Then I received a letter from a fellow agent located in Florida."

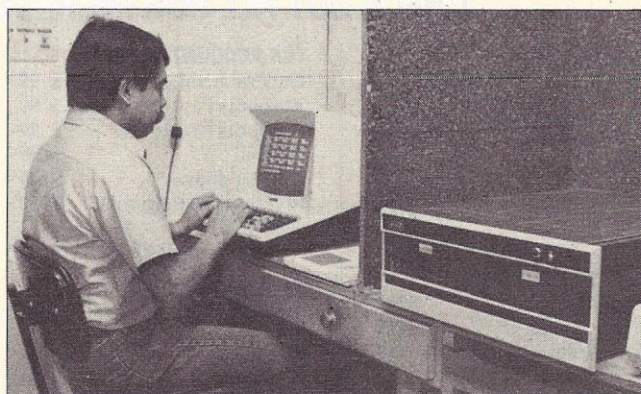
This Florida agent, Jim Austin, had worked with Threshold Software to develop BUSS, a two-part software package. The first part provides scheduling and

pricing capabilities, while the second part provides a bookkeeping system.

Gonzalez had the solution to his problem. He ordered the computer and the software, which were both installed in his agency in late July 1981.

Before it got the computer, the bus station employed two full-time operators to handle up to 1000 route and fare information requests per day during the summer, and between 400 and 600 calls during the winter. Each call averaged five to six minutes, and customers would frequently tire of holding, hang up, and call a competitor. It was this situation that Gonzalez hoped to remedy.

"By having our scheduling and pricing information on line, we reduced the length of the average phone call to approximately one minute," Gonzalez says. "This means



Greyhound station agent Ernie Gonzales makes fare changes at the terminal of his Altos computer. The computer has reduced this task from three hours to five minutes.

that we can handle a greater volume of calls, and customers aren't left on hold. Therefore, our actual ticket sales increase." Also, only one operator is now necessary, even during the peak calling season in the summer.

Gonzalez figures that the computer system costs approximately \$17 a day to run. "I couldn't hire a part-time employee for that," he says. "And it is also a tax write-off. The cost is justified, no matter how you look at it."

His system consists of an Altos ACS/8000-10 computer with 208k of memory and a 10-Mbyte Winchester hard disk drive. Two of his three terminals are currently in use. One is located at the ticket counter and the other is in the information room. The third terminal will be used for the bookkeeping part of the system.

Because most of Gonzalez's business is within the state of California, 95 percent of the data base is concerned only with California fares and scheduling, while the remaining 5 percent is dedicated to the rest of the United States.

If a customer requests route and fare information to San Francisco, the operator simply types "San Francisco"

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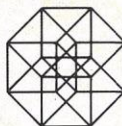
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on the keyboard. Five possible departure times then appear on the monitor, each listing the date, departure time, transfer points and arrival time. If none of these are suitable to the customer, the operator calls additional departures in segments of five, by pressing a single key, until an acceptable date and time have been found. After the fare appears, the operator presses the "P" key and the schedule is printed out for the customer.

Gonzalez also uses the computer to make changes in fares. In-state and out-of-state prices are treated separately because percentage increases in fares differ. This allows the percentage to be changed on a single pass of the data base. The process of changing a fare used to take almost three hours; with the computer it takes about five minutes.

"I sign onto the system, and the computer asks what percentage the change will be and if it is an increase or decrease," Gonzalez says. "Once I have entered the response all fares are automatically changed by the percentage indicated, and a printout is issued listing the new fares. I'm really pleased with the whole system."

CATTLE BREEDER HAS NO BEEF WITH PERSONAL COMPUTER

With the help of a Vector Graphic System B computer, Richard and Jane Judy are helping to accelerate the changeover to leaner, less costly meats for consumers. The Judys, the fourth generation to run the family's 5000-acre cattle ranch near Mankato, Kan., are seed stock breeders who raise bulls and cows that will be sold to other ranchers to improve the caliber of their herds.

Until a few years ago, Angus, Shorthorn and Hereford cattle grazed on prairie ranches. When steers were more than a year old, they entered feedlots where, for another five months, they turned corn into layers of heavily mar-

bled beef. Then came all the concern about cholesterol and heart disease, leading the diet-conscious American housewife to change her family's eating habits. She began searching for the kind of lean beef once discriminated against. In addition, tighter family budgets produced a demand for a less expensive beef.

In 1975, a time when the demand for leaner and less expensive beef was strongly felt by ranchers, the Judys gave up lucrative Toronto careers to run the family ranch. The family, along with Richard's father, Bradley, were among the pioneers in the cattle business with the Simmental, a new breed of cattle known for its lean meat, which was brought to the United States from Switzerland.

Without the aid of their computer, the Judys say that they could not manage the enormous record-keeping required by their company, BGR Simmentals. They also use the machine for a variety of purposes including maintenance of the herd record system, correspondence, production of marketing bulletins and financial management. And after 5 p.m., it also helps the Judy children do their homework.

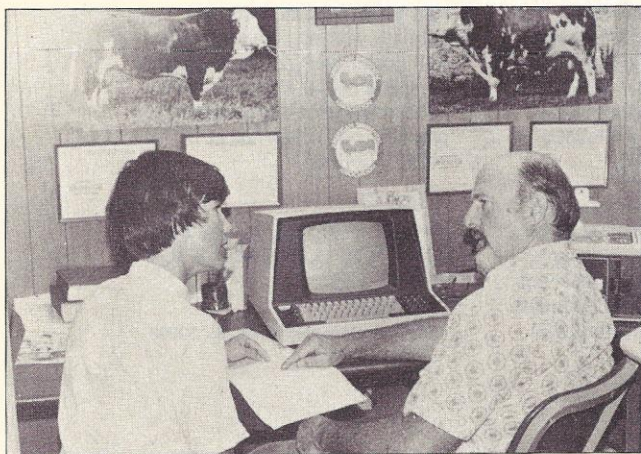
"We looked hard at a lot of computer systems," Richard Judy says of his search for the right system to handle his business. "The Vector System B offered the memory capacity we needed—48k, plus 630k disk storage. It also has powerful BASIC software and a Z80 microprocessor." Reliability was also an important factor since the Judy ranch is more than four hours from the nearest city with major computer service facilities.

The Judys have a major advantage over most ranchers when it comes to selecting a computer. Richard has a doctorate in economics from Harvard University and 11 years as a professor of computer science at the University of Toronto. Jane has a master's degree in public administration from Syracuse University and was a systems analyst for Systems Research Group of Toronto.

The Judys maintain elaborate records of their Simmentals with The Herdsman, a software program they wrote themselves. The records include details of the pedigree, vital statistics, breeding in past years, length of gestation and calving ease, as well as the weights of all calves at birth, at weaning, and at one year of age. Since most of the breeding is done by artificial insemination, the records also show how many times each cow required breeding before conception.

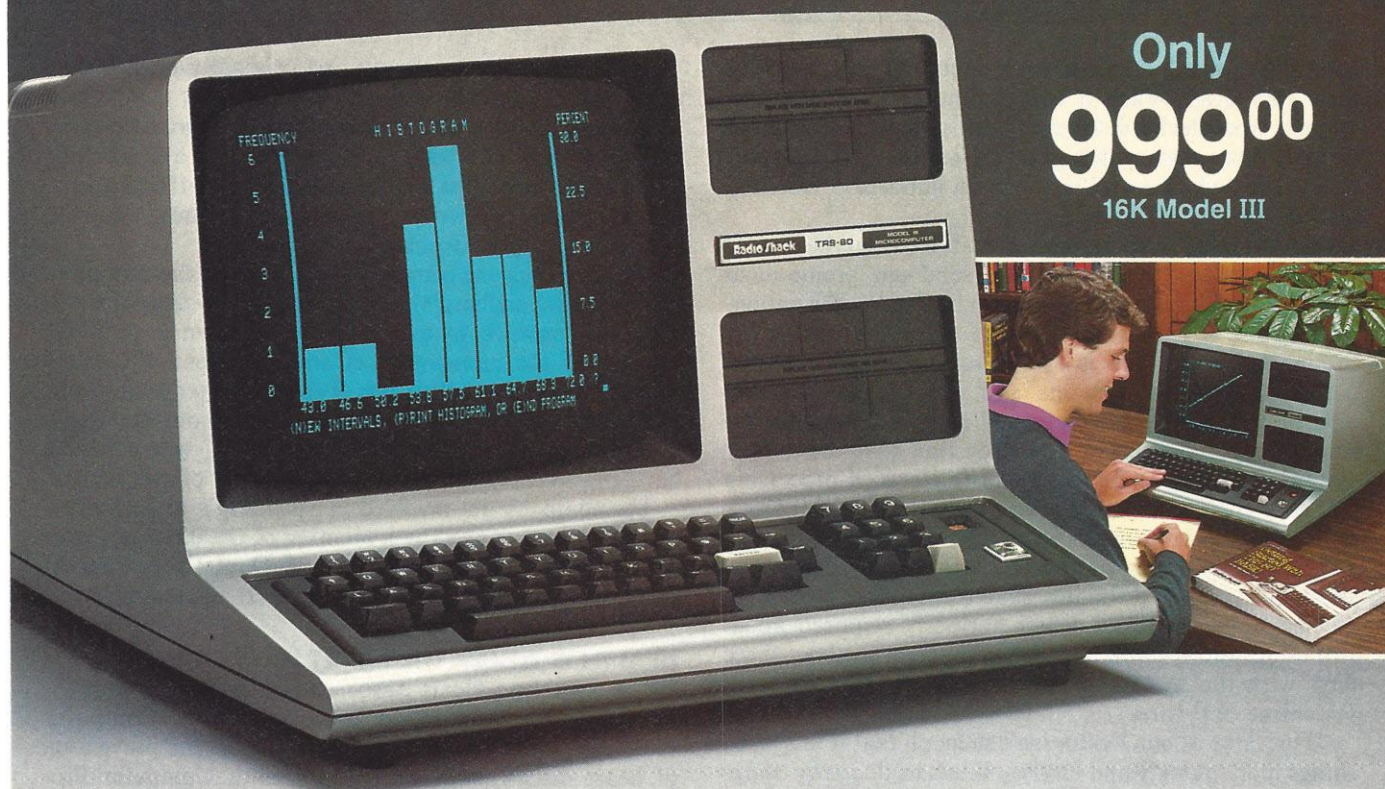
Superior cows will be able to produce calves annually, and raise a calf that in six months will reach a weaning weight of nearly half that of its mother. Calves like this, after a short time on a finishing ration, are ready to become steak. This provides the consumer with leaner and less expensive beef.

While other seed stock breeders keep similar records manually, it is nearly impossible, the Judys believe, to



Richard and Jane Judy maintain elaborate records of their cattle herds with their Vector Graphic System B computer. They also use the system for word processing and accounting.

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OUTLOOK

maintain as much detail on each animal as they can with their computer. When it comes time to select the best animals from the herd, the computer sorts the records and chooses those that rank highest in key categories, eliminating the task of searching through hundreds of written records for this information.

In addition to keeping records on the cattle, the Vector Graphic system helps the Judys send out promotional mailings for a sideline of their main business—the nationwide selling of semen from some of the finest bulls of the Simmental breed. This is a large-scale operation, mainly based on personal contacts and old friendships. Previously, the family rented an IBM mag-card machine for this correspondence, but now they find that the Vector system and the company's Memorite III word-processing software costs substantially less than the mag-card system and provides a much wider variety of functions.

The financial side of the business is Jane Judy's responsibility. She estimates that transaction processing and cash-flow analysis, which formerly required about two weeks each month, are now completed in about three days with the System B and accounting software from Peachtree Software.

"The value of our Vector isn't so much that it lets us do things more quickly and easily—it lets us do many things that we couldn't do at all before," says Richard Judy. "We can't make cattle breed any faster, but we can breed them better. Most of us in this business think that we can pick out good animals just by their looks, and we're probably right about half of the time. But that's far from good enough. The computer can tell us things about our animals that we'd never know in a lifetime—theirs or ours."

COMPUTER STARS IN E.T.

The box office smash *E.T.*, from director/producer Steven Spielberg, not only stars a little alien creature, but a computer system from Qantel Business Computers of Hayward, Calif. The computer, a Qantel System 355, was called in to play a major role in the government's unsuccessful effort to help the gravely ill space traveler.

Interfacing with various medical instruments in its scenes, the computer kept track of all of *E.T.*'s and Elliot's (the alien's telekinetic friend) vital signs and graphically illustrated how the creature's responses were mirrored by the boy. Spielberg used extremely tight close-ups of the Qantel CRT screen to show how the progress of the two was carefully graphed and monitored by the computer. The machine contributed heavily to a key scene when Elliot began to recover as *E.T.*'s vital signs declined, indicating that the two were again separate beings and no longer shared the same emotions and physical symptoms.

To provide for these graphics effects, programming experts at Qantel redesigned an old game program called

"Snake" which the company had originally modified to demonstrate the graphics capabilities of its computers. "Since we didn't know in advance what special effects would be required," says David Freedman, a marketing applications specialist at Qantel who wrote the program for the movie, "we wrote a program that would allow us to put anything we wanted on the screen."

Another trick the company used to make the computer conform to Spielberg's filming needs was to make the program sensitive to a control signal from a terminal located off the immediate set and, thus, out of camera range. This allowed close-ups of the computer monitoring the changes in the patients' conditions without showing a person's hands controlling the keyboard, which would have interfered with the dramatic effect of the scene.

The company got involved in Spielberg's project when they were approached by a member of the director's production team who had worked with Qantel personnel on other projects, including the *Get Smart* television series.

HEALTH IS WHERE THE HEART IS

The American Heart Association's Greater Boston Division, in conjunction with Classroom Computer News, is taking an electronic approach to the prevention of heart disease with a "Heart Health Computer Programming Contest." The contest is designed to solicit the development of personal-computer programs to educate young people about the importance of good health habits early in life. The programs—for elementary, junior high and high school students—should stress the many ways that heart disease can be prevented.

According to the Heart Association, prevention is the key in the treatment of heart disease, and lifestyle changes and early lifestyle intervention must be stressed to young people. Thus, the association advocates three basic areas of program content: no smoking; aerobic exercise which includes running, jogging, brisk walking and swimming; and a healthy diet which includes low cholesterol, low fat and low salt foods.

In addition to no smoking, exercise and diet, other program topic areas that the group would like to see are: anatomy and physiology, including blood pressure (for all educational levels); stroke, heart attack and high blood pressure (more appropriate for junior and senior high school students); and lifestyle, life expectancy and high-risk factors. The group would also like to see programs that emphasize user interaction with the software, either in a group or on an individual basis.

The focus on computers and their effectiveness in the schools stems from the many recent cutbacks in funding for schools and their programs. Because money is tight in the school systems, health education is one of the first programs to be terminated, but purchases of personal computers have not declined. The Heart Association felt

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OUTLOOK

that it needed another way to teach children about heart health, so it decided that working with computers and software was the most effective way to accomplish its objectives.

The programming contest is open to everyone. Although the programs will ultimately be used in the schools for the benefit of students, aspiring programmers will also benefit from the contest; to write programs, they will be forced to think about the causes of heart disease and logical ways to prevent it.

The best program entry will receive \$1500; 11 other entries will each receive \$500. Programs should be written in BASIC to run on the Apple, Atari, TRS-80, Texas Instruments or Commodore PET personal computers. All entries must be received by January 31, 1983. A panel of computer and education experts will serve as judges, and plan to reach a decision by the spring of 1983.

The programs will initially be tested and distributed in the Massachusetts area; they will then be made available nationwide through the Heart Association, headquartered in Dallas, Texas. The Greater Boston Division is currently putting together a package of risk factors to aid in the development of the programs.

For more information on the contest and what the association hopes to accomplish, please contact the American Heart Association, Greater Boston Division, 33 Fourth Ave., Needham, MA 02194, before December 1, 1982.

DOWN TO EARTH TIPS ON GARDENING

Confused about when to plant your next crop of tomatoes? Do you know which is the best fertilizer to use on problem soil? Which are the right tools to use when tilling rocky soil? All of these questions can be answered when you log on to Victory Garden, CompuServe Information Service's new information provider.

Victory Garden is a collection of articles designed to aid the novice or expert gardener in such areas as soil preparation, seed choices, planning, planting and harvesting. There are eight major topics from which to choose: an introduction to the information contained on the new data base; starting a garden, which deals with soil, tools, planting, and preparing for planting; caring for a garden; individual crops; selected topics, including herb and organic gardens; troubleshooting typical gardening problems; a gardener's almanac, which contains articles on the best time to start planting which crops in your particular area of the country, the pros and cons of using a power tiller, and pH testing of soil; and an interactive question and answer section in which the user can electronically mail inquiries to the founder of the data base who will answer through the subscriber's mail box on CompuServe.

The data base also features sections on what tools to use and where to find them, how to go about spacing and

choosing your crops, and what diseases to watch for with certain plants at different times of the planting season. And, at the end of the articles, there are quizzes designed for fun as well as education.

The Victory Garden data base is a creation of Ted Batutis, a member of the agricultural department of Cornell University. He writes tutorials in the area of agricultural economics for instructional and commercial use.

For more information on the Victory Garden and CompuServe Information Service, contact CompuServe Inc., 5000 Arlington Centre Blvd., Columbus, OH 43220; (614) 457-8600.

COMPUTER COMPANY ORCHESTRATES GIFT TO LOCAL SYMPHONY

As the Oakland Symphony Orchestra tunes up for its 49th season under the musical direction of Calvin Simmons, an unconventional instrument will be orchestrating administrative tasks off-stage—a Decision 1 computer donated by Morrow Designs of Richmond, Calif. The symphony management will use the computer for payroll, forecasting and word processing, primarily in the management of its subscription lists and for the recording of ticket sales to help in their marketing effort.

Morrow Designs' top-of-the-line Decision 1 features 65k RAM, a 10-Mbyte hard disk drive, an 8-inch floppy disk drive and software packages including the CP/M operating system, BASIC 80, CalcStar and WordStar. The system has a retail price of \$8000.

"This gift will contribute substantially to the success and effectiveness of our office operation," says Oakland Symphony general manager Arthur Jacobus, "and will help us in working to maintain our high musical standards and continue the educational programs so valuable to the community."

WEATHERING THE ECONOMIC STORM

C. Jim Rice, president and founder of Balanced Investment Planning Inc. of Marietta, Ga., is clearly a leader in the field of financial planning and life insurance, as his membership in the highly exclusive Million Dollar Roundtable (an honorary club for people who sell \$1 million worth of insurance coverage) attests.

But with inflation and high interest rates threatening to cut into his commissions, he's developed a sophisticated financial software package for the personal computer that is enabling him to weather the economic storm.

Rice's clients are primarily owners of closely held corporations, and his success has been a result of the thorough job he does in showing them how they can use their corporations to maximum tax advantage.

A complete financial analysis used to take Rice 40 to 60 hours to prepare. "I would do it partly manually and partly using Computone, one of the best automated

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financial planning systems," Rice says. "With Computone, we would have a terminal in our office hooked up to their mainframe. The problem with the set up was that it was so fragmented. It would take me up to 60 runs for just one analysis."

That was before he purchased a Wang 2200 personal computer and created the software company, Rice Systems Inc., to produce a financial planning/life insurance software package. "All the available packages were so incomplete," Rice complains, "so I decided to develop a system that could accomplish everything. And since I was spending so much money on development, I decided to sell the system to other agents as well to recoup my expenses."

Rice Systems used Rice's knowledge and experience as well as a team of lawyers, accountants, programmers and even a psychologist to write the program. The objective of the package is to maintain a high level of client service while freeing up more of the agent's time for actual selling. In fact, the 40 to 60 hours that it used to take to prepare a financial report has been trimmed to one to two hours.

Rice bought his Wang personal computer in January of 1981. One year later his company had completed initial development of the program that Rice feels will revolutionize the selling of life insurance and financial planning.

By June of this year the system was marketed. Six have already been sold. The agent/customer can purchase it in one of two ways: He can lease it for 20 years for \$79,000, plus \$7900 a year for updates; or he can pay \$4000 plus 50 cents for every page the program produces, a figure which Rice monitors through a modem installed in the customer's computer.

The financial planning section, the heart of the program, works this way: The client is asked to complete a special 51-page fact-finding questionnaire that focuses on all aspects of his financial situation: his assets, liabilities, goals, wills, trusts, etc. The questionnaire typically requires about an hour and a half to complete. The information is then keyed into the Wang where it is automatically assembled into a client data file that can be accessed by the agent in preparing a living or estate tax plan.

The computerized system has been designed so a client can achieve his long-term personal and business financial goals—and save significant tax dollars in the process.

"Take the case of an individual with an annual income of \$130,000 and five children whom he wants eventually to put through college," explains Rice. "We can tell him how much to invest today in a lump sum or annual investments to pay for each child's education at various interest rates. The computer automatically performs the calculations on the various alternative investment approaches—insurance, trusts, income-splitting, etc.—and lists the trade-offs as they relate to that individual's particular situation."

The client then receives a 50-page report summarizing his personal plan. "The cost of this service from a tax attorney," Rice claims, "would be \$3000 to \$5000. I charge only \$1000. A Honolulu agency to which I sold this system charges \$950. Since the agency pays 50 cents a page for the 50-page report, their profit on about two hours of work is \$925."

The system is designed to do more than financial planning; it is a complete office management program. For instance, when an agent receives an application for insurance, the information is keyed into the computer. The program determines if doctors have to be contacted for medical histories. If so, a letter is printed automatically. And if in a period of time there is no response, a follow-up letter is then printed. The program can even produce a psychological profile of the client to help the agent complete his sale. It will also do commission statements, direct mail and routine office duties.

RESEARCH TO PROBE SHARING OF COMPUTER POWER

Is networking the future of personal computing? Research is planned at the University of Wisconsin at Madison to answer that question.

Edouard J. Desautels, one of five computer-science professors who will do the research, says, "This system is what personal computers are going to be like in a few years." The system comprises \$150,000 worth of equipment connected into a computer network, and computer programs donated by Hewlett-Packard.

The researchers are trying to determine how personal computers can be interconnected to do shared or distributed processing.

In shared processing, any computer within a network can call on the calculating power of the entire network when it is faced with a problem too big to handle alone. The professors think that shared processing could let business and personal-computer buyers choose smaller machines because the power of the other in-house computers would easily be available for occasional big jobs.

The toughest question in shared processing, according to Professor Charles N. Fischer, is telling the computer network how to decide the best way to do a particular computing job with an individual computer or with a network of connected computers.

At Wisconsin, researchers will be using four HP 9836A computers with screen displays, printers and disk memories that hold up to 27 Mbytes of information. Each computer will have 1¼ Mbytes of memory.

Research on computer programs needed to manage such a network is in its infancy but is drawing increasing attention. UW-Madison has been active in several such projects during the past year, including one funded by a

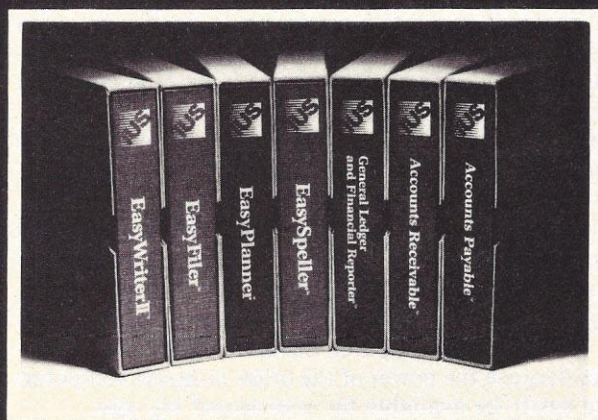
(continued on page 188)

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Harry Garland On The Future And The S-100 Bus

As Cromemco's president, Harry Garland is the man who makes the big decisions, but he doesn't neglect the nitty-gritty. When he and Roger Mellin, his partner, started Cromemco from scratch, the personal-computing industry was not yet a gleam in the eyes of those it has made rich and famous. Then it was all detail.

From a small beginning—making sophisticated boards, like analog interfaces, for the S-100 bus—Cromemco has now become, in Garland's words, "the largest manufacturer of S-100 computers in the world."

In electrical-engineering terms, a bus is a way of interconnecting parts of an electronic system. The S-100 bus is the one most used to perform this interconnection in personal computers.

Garland came by his technical expertise honestly. He holds a Ph.D in Electrical Engineering from Stanford University and was assistant chairman of that university's EE department before devoting full time and attention to Cromemco.

It was a beautiful California day when Personal Computing met with Garland in his office in Mountain View. Blue sky, golden sun, clear air—a perfect complement to Garland's natural smile and charm. He's not the least bit stuffy, but he can speak as a nuts-and-bolts engineer about the kinds of computers that meet people's needs.

Discussion centered on the details that will shape the big picture in the future of computing.

I have heard it said—in fact, Steve Jobs said it two years ago—the S-100 bus is dead. No computer is going to use it again.

Garland: Yes, I've heard that. But you know what Mark Twain said about the rumors of his death. And, really, there is still a very important role to be played by bus-oriented machines. The real question is bus-oriented machines vs. single-card implementations of machines.

Single-card machines like the Apple?

Garland: Yes, like the Apple, which is a single card but has a small amount of expandability with an I/O bus. A

"A single-board computer allows a person the lowest initial investment."



bus-oriented machine is more expensive to manufacture. However, in the long run a customer who is looking to upgrade his system has the option to do that with a bus-oriented machine. And it can be done incrementally at a much lower cost than if he bought a single-board machine and had to toss that machine away and buy a whole new machine, whole new software, to implement an expanded system.

So the initial cost of a bus-oriented system is higher. But if—and I think the whole history of computing suggests this is the case—if, indeed, people find the computer useful and then want to expand its capability, the ability to do that incrementally is much less expensive with a bus-oriented machine. So that's the trade-off. The initial purchase price is higher for a bus-oriented machine, but long-term costs of ownership could well be much lower.

So if you found something else that you could do with your computer, you could do it much easier.

Garland: Yes, that's right. Let's say you need to add more memory, or put in an analog interface or an IEEE 483 interface, or you want to add more users to your system—these are all things that can be done at very low incremental costs with a bus-oriented machine, where with a single-board machine it might be impossible to do at all.

Are all minicomputer systems bus-oriented machines?

Garland: Yes, typically. So what we're talking about is definitely a big computer architecture. But that, of course, is not the only way to go; I would never say the single-board based computer is dead. And there's a very good reason for that. A single-

INTERVIEW

board computer allows a person the lowest possible initial investment and perhaps a very suitable machine for whatever his application is.

But when that application grows he may have a problem; is that what you're saying?

Garland: Yes, indeed. He may have to start with a whole new computer system. And the big cost then is duplicating all the software that he has developed. It may very well not be compatible with that of the new system because, with one notable exception, you can't take the software from a personal computer and move it on up to larger machines.

That one exception you refer to is, of course, your own C-10, I take it?

Garland: That's right. The C-10 is not only capable of using the same software, it's even media compatible. You can take a disk out of the C-10 and plug it into a larger machine and the larger machine will play it directly.

But isn't the S-100 bus a hobby bus really?

Garland: I think not. If you take a look at our current customer base—and we are the largest manufacturer of S-100 bus products—the bulk of our customers are in industrial and professional fields.

Let me put it another way. Don't you have to be some kind of a computer maven to be able to really get the most out of an S-100 bus-based computer? I mean, it sounds very complicated and very technical.

Garland: It's really not. In fact, it's much easier, when you are taking a look at configuring the system, to do it with a bus-oriented machine than any other way. You simply purchase the modules you need for your job, plug them into the bus, and it allows you to really tailor the computer system to your specific needs.

What about addressing and things like that?

Garland: Well, there's no question but that you have to have your memory in the right bank, and you have to set

some switches properly—that sort of thing—which requires somewhat more technical skill than a machine that has no options whatsoever. But for that additional effort you get quite a bit more in terms of modularity.

Is there a standard processor for the S-100 bus?

Garland: The bus was originally designed for use with the 8080 processor. We were the very first people to put the Z80 processor on the bus and, in fact, we were Zilog's (the Z80's developer) very first customer. So the very first application of the Z80 was on the S-100 bus. And now we're the first people to put the 68000 processor on the bus, and I believe that within the next year the 68000

“In a single-user word-processing system the processor is just loafing along.”



may well become the most popular processor on the market.

One simple reason for this is that the S-100 bus has 100 pins, many of which were not even used with the original 8080 implementation. What this allowed was tremendous capability to expand the power of the bus with time so that the 68000, which has a 16-megabyte address base, can easily be put on the bus. That cannot be done with any other of the original computer buses. And which pins are used for what in the new 16-bit processors is part of what is defined in the IEEE 696 standard, so the nice thing is that everyone will be implementing it the same way.

Well surely other semiconductor manufacturers are looking at that and saying they're going to jump on the bandwagon. They have to come up with some sort of answering product, don't they?

Garland: The 68000 processor itself is multisourced by more manufacturers today than any other 16-bit processor. What has happened is that the 8086 has been used in a lot of designs because it was available sooner. Of course, it is less capable than the 68000, but it is so well entrenched that it will certainly be around for quite some time. I think IBM's use of it alone speaks for the longevity of that product. The 68000 is a much more capable processor, but it has been available in final form for only about the last six months. If you take a look at the new designs of today, they are strongly favoring the 68000. I read that something like seven out of eight new designs use the 68000 over the 8086.

OK, but why do you want a 16-bit processor anyway?

Garland: Well, if you take a look at the range of applications for computers, you can see that some applications are compute-bound and some are not. If you take, say, a single-user word-processing system that is in no way compute-bound, you are limited only by the speed of the typist, by

the speed of the printer. And the processor—say, the Z80 processor in our current system—is just loafing along. To take and put a 68000 in that kind of environment is an absolute joke! It's like putting a 1000 horsepower engine in a Volkswagen beetle. It just doesn't buy you anything.

However, there is a class of applications that is compute-bound. Where you get into this is when you have, say, multiuser systems with many people taxing the processor at the same time. Or you get into scientific and engineering applications such as computer-aided design. One application we have for our machine, for instance, is structural engineering where a civil engineer wants a personal computer for designing buildings. It turns out that there are some very complicated matrices that have to be evaluated to be able to design these buildings.

Because you've got a closely coupled physical structure there?

Barland: Right. You're dealing with—to a first approximation—first-order linear differential equations. And it's not unusual to have 100 by 100 matrices (that's 10,000 numbers) to solve. This is the kind of thing that could take many hours or even days with the Z80. But a 68000 would reduce that by roughly a factor of 10—to maybe a couple of hours.

What it is, then, is a big number-crunching application, isn't it?

Barland: That's right. But the other important thing about the 68000 is the address space. With the Z80, you have 64k of address space; with the 68000, it's 16 megabytes. If you take a look at some of the programs that are run today on minicomputers—large programs that have been developed over a period of time—they may well be half a megabyte or a megabyte long. There's just no way that they can be run in any convenient way on an 8-bit processor with a 64k address space. The 68000 opens up
(continued on page 38)

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INTERVIEW

HARRY GARLAND

(continued from page 35)

the opportunity of using those software packages at a personal-computer price. So there's a large amount of very sophisticated software, which to date has been unattainable in the personal-computer world, that now can be brought over. *OK, but there are ways of fooling a processor, like bank switching, are there not?*

Garland: Sure, it can be done, but the problem is that then you start to sacrifice speed of execution very, very much. You have to keep swapping back and forth to the disk, and the disk is very, very slow compared to internal memory. So your application then becomes I/O bound. You've put it in a configuration with relatively limited memory—in other words, a non-bus-oriented approach.

When you say relatively limited, you mean as compared to the total address space, I take it? Because we're talking about an eighth of a megabyte start—a quarter of a megabyte maximum, right?

Garland: Yes, a quarter of a megabyte or maybe even a half a megabyte in some machines. But if you take a look at how much they're constraining the 68000, you can make an analogy with, say, the Z80. If you take a 68000 system and limit your implementation so you only use half a megabyte, what you're using is only 1/32 of its memory capability. If you were to build a Z80 system in the same way, that Z80 system would only have 2k of memory. It's interesting—and kind of an absurd analogy—but the MITS Altair computer came standard with a 2k card, and that was thought a lot at the time. Nowadays people are up to the limit of the 64k.

Are you suggesting that five years from now we'll look back and say that any 16-bit computer that had a half megabyte of memory was just such an early implementation that people simply didn't understand?

Garland: Five years from now, it will seem like a joke. We will not understand how anyone could put so little memory with that processor. There's just no question about it.

Why does memory need—perceived memory need—expand like that? Parkinson's Law?

Garland: The reason is there's always a trade-off between price and performance, and memory price has been coming down rapidly and is continuing to come down. You can always use more memory if it is cheap enough. For example, very commonly you'll have a five-megabyte disk drive on a system. Now why do you have a disk drive there and access it all the time? Suppose memory were cheap enough that

“There's a lot of software that has been unavailable that can now be brought over.”



you didn't need your five-megabyte disk drive. Suppose you could store all that information in your main memory. Now you're talking about an improvement in the speed of your computer where you're retrieving documents and storing things, this kind of thing. Your performance is increased by a factor of 1000 in speed because you can access the main memory of a computer 1000 times faster than you can a mechanically rotating disk drive. So, if RAM becomes cheap enough, more and more will be stored there because it's a factor of 1000 improvement in speed.

The numbers are mind-boggling. You say it's 1000 times faster to access main memory than it is to access a five-megabyte Winchester disk?

Garland: That's correct.

And a Winchester disk is itself another 10 times faster than a floppy disk, right? So what you are talking about is something like, say, a 10,000-fold improvement in speed over that of a common personal computer?

Garland: That's exactly right.

Simply by using a 68000 and throwing in lots of memory?

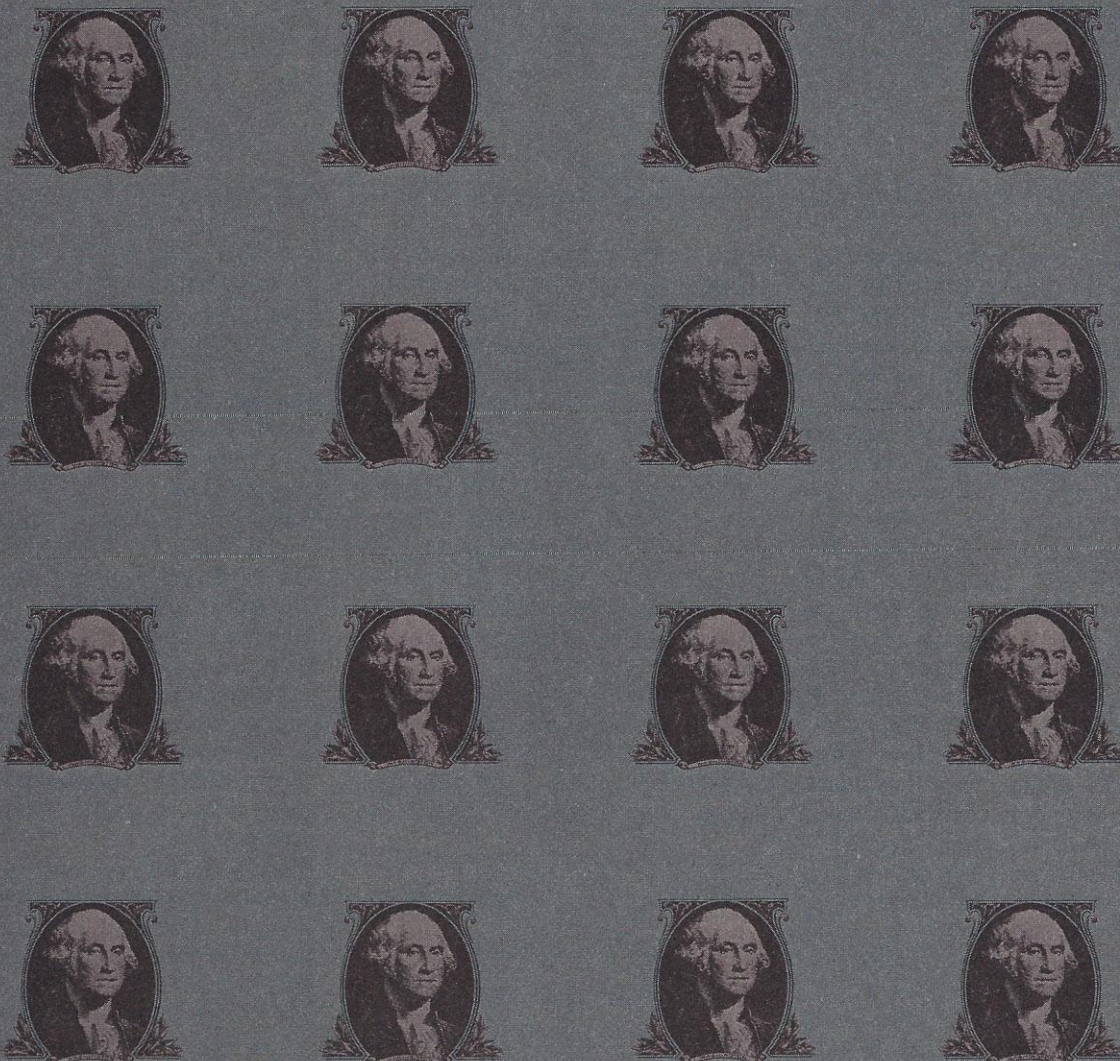
Garland: Lots of memory. And as the price of memory continues to come down, we will continue to move in the direction of more sensible type configurations.

In another year or so, when 256k memory chips are available, what effect will that have?

Garland: We already have a board designed for those chips. We have a 2-megabyte S-100 board, and eight of those will give you a full 16 megabytes.

What's that, roughly, going to cost—for 16 megabytes of memory? What's the comparison with today's prices on that?

Garland: Historically, if you were buying memory for a mainframe computer, the typical price for a megabyte of memory was \$1 million, or a dollar a byte for high-speed



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INTERVIEW

mainframe memory. Of course, that cost has been coming down and will come down very, very fast as the new chips come up. For example, we have a half-megabyte card that we sell for \$3000. That's \$6000 per megabyte. So you are talking roughly a factor of 100 less than the mainframe kind of historical pricing. What we will see with time is essentially the technology behind this driving prices down. We are using 64k chips for a half-megabyte card. The new chips will be 256k bit chips, a fourfold improvement in density. Ultimately, since chips all cost the same, we're talking about another factor of four decrease in price once 256k chips are implemented in systems. Now that won't be when they first come out; when they first come out, they are going to be expensive. But, if you take a look at three or four years downstream, over that time you'll see a factor of four decrease in memory prices. A half megabyte of memory will cost less than \$1000 in 1985. And that's why we feel it's so important to have an S-100 bus design in the 68000. It allows a person the opportunity to use that inexpensive memory as it's developed three, four, five years from now. And we believe people will want to use it because it will be simply a more sensible balance in the ratio of, say, a hard-disk storage vs. internal RAM.

Are you saying that if I had one of your computers or another S-100 bus computer today, that five years from now I could use that same computer and snap in new cards and be able to access all this?

Garland: With our computer, you can. As a matter of fact, if you bought one of our computers five years ago, you could put a 68000 in it today and put 16 megabytes in it with a two-megabyte card when that comes along.

What about software compatibility?

Garland: What we've done on software compatibility is on our 68000 card, we have included a Z80 pro-

cessor. This guarantees, absolutely guarantees, that all the Z80 software will run on the Z80. Furthermore, our high-level languages have made source codes compatible between the Z80 and the 68000. So, you can take, say, a BASIC program and run our interpreter either on the Z80, our current interpreter, or run the new interpreter on the 68000, and run that same program and get the performance advantages of the 68000.

Now is that a program that I, a user, have developed, that you're talking about?

Garland: It's a program that you developed or a package program that you bought that has been written in a high-level language. The only time you get into limitation is when you

have a program written in an assembly language for the Z80, one that could not be quickly converted to the 68000 language.

It has to be rewritten?

Garland: Yes, it has to be rewritten. But it's in a high-level language, so it only has to be recompiled or reinterpreted.

Well, that's interesting. And, of course, I'm sure you and other people will be developing applications that will run on the 68000.

Garland: Right. There's a lot of work being done. In fact, we will see those applications, I think, very, very quickly because there are a lot of manufacturers, including Apple and Tandy, who have announced they are going to be using the 68000 for their products.

What does "very quickly" mean?

Garland: Very quickly means within a year, or a year and a half.

That means if I bought your 68000-based card today, in a year and a half I should be able to find, say, a math package, if I had a need for it, that would run on the 68000.

Garland: Right. You'll see a whole family of packages available for the 68000s, some sooner than a year and a half. But by then you will have a choice in the 68000 comparable to what you have in the 8-bit world today. And, in the meantime, the 8-bit processor is still a new machine, so you can run 8-bit software until there's software available for the 68000.

In light of all this, I'm curious; why did you go to a single-board design in your new computer?

Garland: The reason, as I said earlier, is that there's a need for both classes of machines. Now the new personal computer does not have an internal bus on it. It cannot be expanded with more memory internally, but it does have the advantage of being lower cost, and there are many people who would prefer to pay less up front to be able to get a lower cost machine. The

(continued on page 44)

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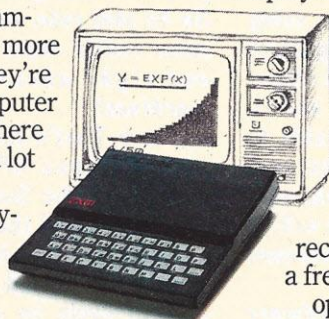
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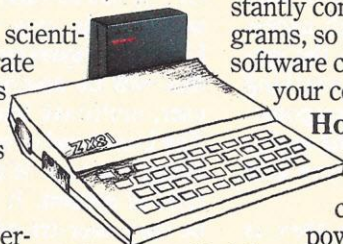
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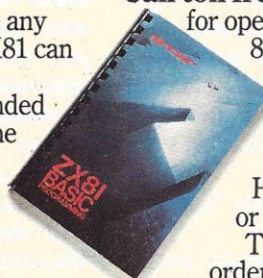
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HARRY GARLAND
(continued from page 40)

reason we've waited till this time to introduce the personal computer is that we're able to do it without deviating from our philosophy of allowing expandability. The expandability comes, though, not with a bus-oriented machine but by allowing a person to use that personal computer as a terminal with a larger Cromemco system, should he wish.

When you speak of expandability, one of the things that comes to mind is graphics. Are you yourself working on more and better graphics?

Garland: Oh yes. We have a high-resolution color graphics display now. Later this year, it will be introduced in a TV camera interface that will allow us to be able to digitize TV pictures in real time. And it's an ongoing area of work.

What does that mean—to "digitize TV pictures in real time?"

Garland: Take, for example, an inventory system. What you will be able to do is have a data base that contains not only a part number and the price and the vendor and the location of an item, but also a picture of that item in your data file. It will be a picture that you take by hooking up a regular home video tape recorder camera to your computer. So when you take an inventory or your receiving department receives a certain part, you can simply call up the file on that item and compare it with a picture to see if you have the proper item. And it's a color picture. So if you're ordering resistors, for instance, you can have the color bands on there and an inspector can compare them to the actual device.

One of the things that we hear a lot about these days is ease of use, and I guess that ties in with graphics. Graphics right now are not easy to use. So I ask what is going to be coming on bus-oriented or single-board machines that you see in the ease-of-use area—to try to make these things easier for people to get into?

Garland: Ease of use is almost entirely a software issue. For example, with our graphics systems we have a program we call "Slidemaster" that allows you to prepare graphics using strictly a bit pad (an X-Y digitizer) with a menu-type approach. It allows someone with absolutely no knowledge of programming to be able to create images and modify them and store them in memory. I think, with time, more and more software will be developed for graphics, but software is what's limiting use today.

But isn't that really a hardware limitation—at least in part? To make things easier to use, don't you need more memory to allow you to put the sophistication into the program?

Garland: In that sense, yes, I think you're right. But once software has gotten up to a certain level of sophistication, more memory, for instance, will make it easier to use simply because things like speed of response can seriously affect ease of use. If you try to do something and have to wait and see what happens through access to a floppy disk, that makes the system harder to use than something that will give you instant response. And, like I said before, having everything in memory will allow you that instantaneous response.

What you're really saying then is that software hasn't even caught up with the 8-bit hardware yet—is that a fair statement?

Garland: That's right, because software cannot be started until the hardware is finished, so software always lags behind. And if you have hardware changing all the time, you're trying to hit a moving target and you never catch up.

Yes, but 8-bit processors have been around for eight years.

Garland: But it has not been eight years since people began seriously developing software. In the early days, people were suspicious of these personal computers. Computing was a thing for some guy to do in a base-

ment, and it's really been only in the last two years that people have gotten serious about it. And it takes two years to write good software.


So by that rule, we should be seeing some really super software coming out right about now for 8-bit machines?

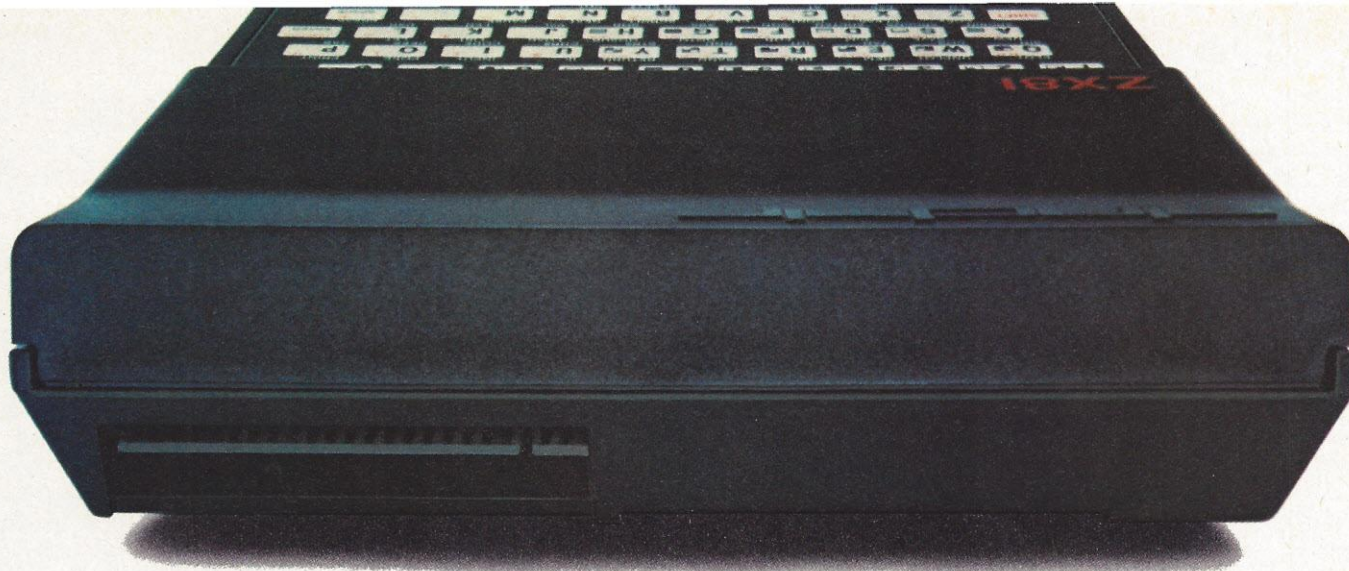
Garland: That's correct. Take a look at the types of packages just emerging—the SuperCalcs and the WordStars and the DBase IIs. These are packages that have all been really quite well received, and yet the development cycle on each of these has really been quite long. There is certainly more software emerging now than there has been at any other time in the past.

Are we also going to see a better operating system? I'm thinking better than CP/M—right now?

Garland: Yes. The question of operating systems has to do with how many capabilities you want from your machine. For single-user, single-task kinds of applications, CP/M has certainly proven itself and seems to do very well. I believe the Unix type systems such as our Cromix will be emerging for the multi-user, multitask kinds of applications. The Unix kind of system is very interesting because it's a very malleable type of system. It can be adapted to be very user-friendly for specific applications. You actually have the option to go in and change what the commands are, and provide a subset of special-purpose commands to any particular user, so that will be emerging, I think, as a rival to CP/M.

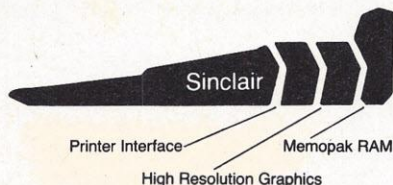
You mean the user kind of sets up his own little virtual machine there?

Garland: He can, although in many cases it takes a programmer to do that. But you can tailor the operating system so that if you have only one user who only does word processing, he has no idea that he is on a computer. He thinks it's a word-processing machine. He turns on his terminal and it comes up with a word-processing menu. 



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CIRCLE 19



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CIRCLE 20

It's Easier Than It Looks

If you're a bit awed by the prospect of an encounter with a personal computer, you're not alone.

But the beast can be tamed

by David Gabel, Senior Editor

I had just booted the program and I was trying to run through a little demonstration. I got to the point where the manual said to load a sample file from the disk. I did. While the file was being loaded, I turned the page in the book, and saw a sample of the way the screen should look. I checked the screen, and it didn't look anything like the book said it should. I was certain I had done something wrong, and afraid that the transgression would have a significance beyond my limited power to comprehend—like maybe the program was wrecked.

That's not a computing neophyte talking. That's me—just about a year ago—describing my first encounter with a personal computer.

To put the encounter in perspective, I wasn't a kid. I was 39 years old, and I'd been around. I'd jumped out of airplanes because Uncle Sam paid people to do that. I'd been in Vietnam, been shot at, had run a data-processing center with one of the big computers in it, and had gained a degree in electrical engineering that said I knew about things electrical, like computers. I knew it all.

Now I was sitting in front of an Apple computer, convinced I had done something catastrophically wrong. I hadn't, but I sure didn't know it.

I figured the best thing to do was get an expert. So I got one. And I asked him what in the world I could do now. He took one look, assumed that slightly superior attitude that those in the know reserve for those not in the know (whom they'd just as soon would never get into the know)

and said, "No problem. I'll fix it in a jiffy." Which he did—so fast I never saw what he did. So I asked him to explain. Which he did—so fast I never understood a word he said.

I have to tell you, I was pretty intimidated. For a long time after that, I'd go around at chic cocktail parties or occasional business lunches and say things like, "Personal computer? Oh, yes, I have one in my office. I find it terribly useful." Which was a crock, because it took months before I was able to find it useful at all.

That's only slightly less honest than saying you don't really need a computer but meaning you're not sure you could run one. Some people really mean they're a little scared of the thing. Some mean they're afraid they might wreck it. It's normal to have those kinds of fears. But you can overcome them.

Time to take action

Computing isn't as tough as it looks. It isn't even as tough as it sounds. But you have to get into it. You can't sit on the sidelines and think about it. You can't just read about it and study about it. You have to do it.

That's not to say that all the other things you can do to learn about computing aren't useful. Watching others helps, as does browsing at the computer dealer's, and attending users'-group meetings. Reading about it can give you an idea of what's in store for you. But reading about computing can sometimes hurt as much as it can help. Sometimes it seems that people who know enough about computing to write about it assume that people who don't know

much about computing are dumb. Certainly many documentation writers fall into this category.

Documentation is the set of instructions provided with a piece of hardware or software. Documentation has to be written, even if it's documentation that will appear on the screen as a program is running, or if it's to be found on warning labels affixed to hardware.

People have been saying for a long time that this country is becoming a nation of illiterates. It's easier than ever to believe that after you read some computer documentation. Some is incomprehensible and some is just bad writing. Very little of it communicates. How is one to learn computing if the written instructions can't communicate, particularly if the writer assumes everyone who reads his documentation to learn how to use the hardware or software is dumb, and so insults the reader's intelligence?

Here's an example, taken from a printer vendor's user's manual, in the section on setting up the printer. "With a Phillips-head screwdriver, remove the shipping screws and save them in case you decide later to lend the printer to Aunt Bernice in Lake Wobegon, Minnesota."

I'm sure the writer was trying to be clever and witty. But what he said insulted me. He told me he thought I wouldn't understand, "Save the screws in case you have to ship the printer later." Many people—I'm one of them—will simply refuse to read any further than they must in such a manual in order to get the hardware operating. That's why it's tough

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That phrase, "Boot the program," for example, is one of the dumbest sounding things in the world. It's indecipherable until you boot a system a few times and totally understand it. It means loading a program, usually from a floppy disk. It's simply telling the computer what to do.

Doesn't the computer know what to do? Not really. The computer can do just a very few things, when you get right down to it. It can add. It can move data from one place to another. It can't do too much more.

Some stupendous results

Still, we know the computer accomplishes a lot. Computers are something like water. One drop of water falling onto the ground makes a very small sound. Then it's gone—all evidence of its existence evaporates into the afternoon sun. But uncounted and incomprehensible numbers of drops of water carved the Grand Canyon. Evidence of their existence will last as long as the earth.

Incomprehensible numbers of computer additions and movements of data accomplish similarly stupendous results—results like word processing, number crunching, graphics.

People have put computer instructions together so the machine can figure out what to do with the input you feed it. When you put information into the computer, it responds by executing a series of instructions that put the data in memory, get other data, operate on those data, get a result, if that's what was requested, and finally show the result to the person who requests it.

As you get deeper into computing, you will begin to believe what I'm going to tell you now. The computer does all the things it does for very logical reasons, and it does only what it has been told to do. The people who

wrote the programs wrote them in a very logical manner. Step follows upon step in a sequence of instructions that lead the machine from its starting point to its end point.

That means you can work with a computer. If you can think logically, you can even "think" like a computer. Because when a computer "thinks," it's only reflecting the logical thoughts of the person who programmed it. If you can do things step-by-step, you can run a program.


Overcoming intimidation

Of course, all this didn't help me a bit that first time I thought I'd blown it with my personal computer. All sorts of disabling emotions were running through me, not the least of which was the overwhelming desire to appear expert before those who expected me to be expert. Think of my background. I had to be smart.

Nobody got me out of my predicament. I did it myself. But it wasn't easy. It took all the background, training and experience I had—the very things that were initially causing much of my intimidation—to finally realize that I could admit I didn't know everything about personal computers. I had to learn that if I did something really drastically wrong the situation was not irretrievable. All I needed to do was turn the computer off and start over again.

So it doesn't surprise me when I find that the top executives in many companies don't use computers. They probably suffer from the same kind of intimidation I felt. And they surely, most of them, haven't the tools I had to get me out of that disabling mindset.

It's a good thing that computing is easier than it looks, and easier than it sounds. If it weren't, none but a very few would be using it now. People would stop themselves, simply because of the way people are. That many people don't gives testimony to the ease of using computing.

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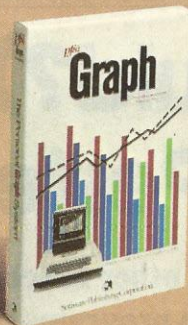
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CIRCLE 11

Could (Should?) An Athlete Be Perfect?

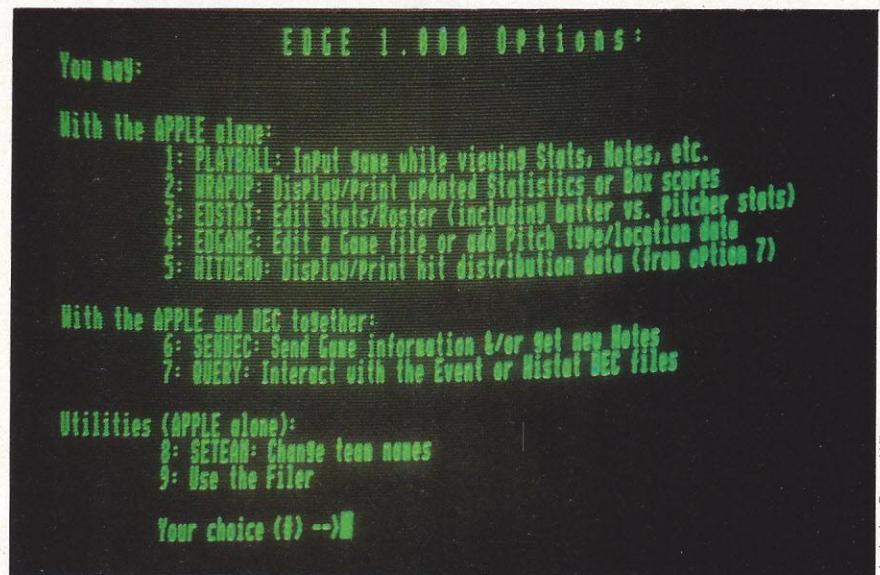
The Texas Rangers—and other baseball teams—are developing sophisticated player evaluation programs for the personal computer in an effort to perfect the athlete's craft and shed a losing image

by Jeffrey Rothfeder, Associate Editor

It was the top of the seventh inning on a hot and steamy August night in Arlington Stadium near Dallas. The Texas Rangers and the New York Yankees were locked in a scoreless pitchers' duel. The Yankees' leadoff hitter began the visitor's half of the seventh with a single to left-centerfield. The next hitter doubled down the rightfield line, scoring the leadoff man. The third Yankee batter singled sharply to straightaway centerfield. Another run scored. And before the inning was over, the Ranger pitcher was knocked out of the box by a barrage of eight hits that led to six runs and a Yankee victory.

The pitcher's season had been going that way—good strong pitching performances marred by one or two innings when it seemed he couldn't get anybody out. Before his next start, one of the Ranger bullpen coaches took the pitcher aside and told him that a flaw had been detected in his pitching mechanics. With men on base—when he pitched from the stretch position and not from a full windup—his right arm didn't follow through completely. Consequently, his fast ball failed to sink but instead rose right into the hitter's power zone. Batters were feasting on chest-high fast balls.

When the pitcher began to pay careful attention to his right arm follow-through with men on base, he gradually restored his motion and his outings improved.



The menu for the Edge 1.000 program offers query-button choices to access a whole range of statistics about the performance of each player on a baseball team.

The Ranger coaching staff would love to take full credit for keen-eyed wisdom in spotting the pitching flaw, but they can't. The credit belongs to an unlikely member of the team's brain trust—an Apple II computer set up to monitor every pitch, hit, run and motion of the Ranger team since the beginning of the season. The computer catalogs the placement of each pitch thrown. When the coaches saw that this pitcher threw differently when men were on base, they were able to pinpoint a subtle problem that had eluded them, and translate those data into corrective action.

What is really at work here is a highly sophisticated form of people management and evaluation. The Rangers are attempting to uncover the not-so-visible subtleties that inhibit the perfection of the ballplayer's craft. The intention is to work with a player's strength and use the personal computer as a training tool to help the athlete achieve his goal of excellence.

The keys to success

For a business, getting the most out of its employees is one of the most crucial keys to success. And to a pro-

fessional sports team—where success is intimately tied to the daily performance of its players—the need to monitor individual ability is especially pronounced. Consequently, a few baseball franchises are leading the way with the development of some of the more advanced personnel data bases currently available for the personal computer. Their story is an account of the way that certain businesses are attempting to gain a leg up on their competition by using the personal computer to evaluate and

improve employee performance.

As one baseball team official put it: "What we are doing (on the personal computer) is simply personnel information development and retrieval, the same as any company would do. The only difference is that our data base is made up of baseball players and not welders."

It is still too early to gauge the kind of influence these data bases will have on the way professional athletes perfect their games. Some teams, the Milwaukee Bucks in basketball, for

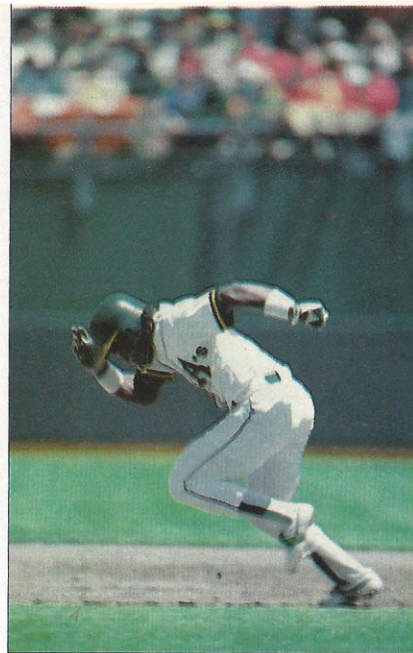


photo by Fred Kaplan

Rickey Henderson of the Oakland Athletics (above) races toward second in pursuit of the major-league stolen-base record. Perfection of this type is what team owners are after when they use personal computers for player evaluation (below).



photo by Doug Wilson



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example, are using personal computers, but only for keeping statistics that can be used by broadcasters or in public relations efforts. These teams are not yet manipulating the information to produce on-field strategies. Some baseball organizations, however—the Chicago White Sox, the Texas Rangers, and, to some degree, the Oakland Athletics—are building up a vast reservoir of computerized player-performance information, which they hope will soon actively influence team play and lead to long-awaited championships.

Disappointed bridesmaids

The last time the White Sox won the World Series—or any other title—was in 1959. Since then they've watched high-priced and highly touted baseball talent like Bobby Bonds and, more recently, Ron LeFlore come, and sometimes go—failing to live up to their promise and help produce a winning team. So, perhaps because they have been perennially disappointed bridesmaids—or perhaps because they are now under a revamped, more forward looking ownership—the Chicagoans were enticed early this year by the promises of two sports lovers and computerphiles, Matt Levine and Dick Cramer. These two men offered the White Sox a customized program for the Apple II that digests and catalogs every single action and nuance of each baseball game. The package, called Edge 1.000, gives back the collected data in any variety of statistical ways, permitting club management to make a host of conclusions about the team's playing personnel.

After almost a year of working with Edge 1.000, White Sox officials say they are now collating the season-long information that they will use to make player improvement and personnel decisions during the coming winter layoff. No definitive results have yet been reached, but team executives are not short on ideas about how they intend to make Edge 1.000

work for the White Sox. "The kind of information we're developing shows, for instance, that certain batters hit better when the count is 0 and 2 on them than when the count is 2 and 0," says Jack Gould, a White Sox vice president. "This, we conclude, is because the player has better concentration when the count is stacked against him. We haven't gone to a ballplayer with these results yet because we want to build up a complete data base first."

Gould adds that the decision to purchase Edge 1.000 and the Apple computer was not a difficult one for an organization of modern-day corporate managers who represent a sharp contrast to the tradition-bound baseball men of the past. "In our club many of the officials are very successful businessmen," he says. "And we know that in order to survive today, even if you're the corner grocery store, you have to own a computer."

It is an interesting sidelight, then, that the baseball world's acceptance of a business tool, like the personal computer, is spawning sophisticated employee performance evaluation methods that will, in turn, be especially useful in the business world at large.

A bird's-eye view

After each game, a White Sox scout, who gathers the playing data from his perch behind the home-plate screen, inputs the detailed information—the type of each pitch and its location, precisely where the ball was hit, who fielded it, how the play was concluded—into the team's Apple. From the Apple the information is sent to a DEC 1092 mainframe in Philadelphia, via modem, where it is stored. And before the next day's game the data are downloaded from the DEC to the Apple, collated into the type of statistics that team officials want to see, printed out and then circulated among management.

Dick Cramer, who develops pharmaceutical products using computer



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“The intention is to use the personal computer as a training tool to help the athlete achieve his goal of excellence.”

technology for SmithKline Beckman Corporation in Philadelphia, is the designer of Edge 1.000. Interestingly, Cramer says that his psychological habit of dealing with organized mental models and patterned statistical formulas makes his two occupations—being a SmithKline chemist and a player data-base purveyor—compatible. As for Edge 1.000, he adds that spelling out specific flaws and strengths in the makeup of a team's personnel is where the system will truly shine. For instance, the weak link in what was expected to be a championship White Sox team this past year has turned out to be the pitching staff.

“One analysis that might be done over the winter will be accomplished by dividing the strike zone into nine squares,” Cramer says. “And if you take square D4 as an example, we will question whether certain White Sox pitchers were hit harder than the average major league pitcher when he pitched to that spot. If we find that they are, then we can jigger the statistics to determine if an individual pitcher simply didn't have good stuff or good mechanics when he pitched to that square. Or we can determine if the pattern of pitches he used telegraphed that he was going to come in at that square at the same count for each batter.”

Circus catches and fast reflexes

For a more concrete example, last year Cramer independently documented that the dominance of the young pitchers on the Oakland Athletics in 1981 was due in large measure to superb fielding by the team's fleet-footed outfielders, Tony Armas, Rickey Henderson and Dwayne Murphy. Without their circus catches and quick reflexes on hard line drives, Cramer's statistics showed, the Oakland throwers would never have compiled the kind of excellent records that they did. And with the A's recent purchase of the Edge 1.000 program and a disappointing

campaign in 1982, Cramer plans to help the A's use their Apple computer to determine whether, this year, it was lapses in outfield play that hindered the pitching staff's overall performance.

Moreover, critics have questioned whether Oakland manager Billy Martin overworked his starting staff in 1981, which could have led to the pitchers suffering from arm fatigue during the whole of the 1982 season. The Apple will be asked to help answer that question also.

But is it complicated?

“We can check this by gauging the changes in a pitcher's performance as he goes each additional inning in a game,” Cramer says. “If he is tiring in, let's say, the fourth inning—much too early for a major leaguer to grow fatigued—then this will show up in the overall effectiveness of his pitches from that inning on. This issue is very important to the A's. They're asking us a lot of questions about this.”

A concern of all businesses turning to computerized personnel evaluation—and one that these sports franchises are grappling with—is whether the new method will be complicated to use and understand. If the information cannot be culled simply, then it has no value to the organization or corporate manager. But it is in this area, many involved in the field say, that the personal computer has made a significant breakthrough. It turns the control and retrieval of the data over to the users without requiring a great deal of computer expertise in return.

“From my point of view this new type of strategic personnel evaluation is only possible because of the development of the mature personal computer,” says Cramer. “Baseball people are not interested in computer technology; they are interested in getting a lot out of their statistics. So the program I've written is one that is easy to use for data input, output and editing, and one that gets results

quickly. Because of the incredible power of the personal computer, you can now get this kind of information when you want it and in the form you want it.”

Personnel evaluation and management is a complex issue with many variables peculiar to each organization. So customized programs like Cramer's are often the right approach, rather than canned data-base managers that may not be flexible enough to be integrated into the needs of an individual franchise. Cramer works with his client-teams to develop separate systems that answer their particular questions. He also takes into account the fluidity of personnel management, changing the input and output of the program as often as the organization needs it. Moreover, Edge 1.000 has query buttons and menu commands that allow its users to bypass understanding the intricacies of the system, but lets them get their data in and out with only the pressing of a few, well-marked keys on the keyboard.

The computerized personnel plan used by the Texas Rangers is the brainchild of Craig Wright, the team's statistician, who gained a good deal of notoriety this past season for a report he compiled on the managerial miscues of skipper Don Zimmer. Zimmer was fired in July, soon after the study was turned over to the Ranger top management.

Taking the bull by the horns

When Wright first came to the team in September 1981, the Rangers already owned an Apple, but it wasn't being used. Management felt that they had to reorganize the way the players were monitored and evaluated. They bought a computer to help them achieve this, but they had no idea where to begin. So Wright hired Jan Kern, a computer programmer and the wife of then-Texas pitcher Jim Kern, to set up a personnel data base that suited the needs of the Rangers. The system, Jan Kern says,

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“When Babe Ruth was asked how he could rationalize earning more than President Hoover, he answered simply: ‘I had a better year than he did.’”

will begin to show results during the off-season and throughout next year's campaign.

Essentially, the Rangers' system works like the one used by the White Sox and the A's. "We have one man who keeps charts during the game of all the pitching and hitting variables," Wright says. "Then after the game somebody else inputs the data into the computer. This is such a meticulous process that it takes three hours to complete—sometimes longer than the game took."

The difference, though, lies in the storing of the information. The Rangers are keeping all the data on personal computer floppy disks rather than warehousing those data in a distant mainframe.

Ranger management intends to use the computerized statistics extensively, to turn around a pattern of losing seasons and unproductive personnel that has been developing since the team came to Texas from Washington, D.C. in 1965. For instance, the program will attempt to work on poor playing mechanics, such as the problem shown by the pitcher previously mentioned. But even more than that, a failing organization has to question how it has not been able to plug the holes that have consistently plagued its operation.

"We're looking at the total team picture, including the aging process, the training process, which specific but maybe unseen gaps have continually stood in the way of producing a winner, and so on," Wright says. "Beyond that we are currently evaluating the value of the major league scouting bureau that we belong to (a seven-team consortium that shares scouting reports). We are trying to find out if it would be better economically and success-wise to go with private scouting or to stay with this group."

Armed with all this new personnel information, the teams are chomping at the bit to fully implement the systems in their organizational struc-

tures. The personal computer is a tool that touts the concept of reducing extraneous data and paperwork for efficiency. And the underlying reason for personnel evaluation software is to afford management a clearer picture of employee progress and work habits, so that decisions can be made with the reasonable certainty that they are not misguided. Thus, the sports franchises are looking forward to finally avoiding endless stabbing in the dark when personnel options are considered.

Free agents and negotiations

For instance, team officials intend to use the information taken from the computers as back-up data when negotiating salaries with players, when making trades, and when considering free agents to sign. Many profligate owners have spent imprudently and hastily in this market, only to receive little on-field success in return. In addition, Jack Gould, the White Sox vice president, hopes that the mounds of paperwork and statistics are finally going to be tamed and made manageable and understandable.

"Last year we went to the winter meetings (where the owners consider trades and other signings) carrying three trunkloads of information that were hard to use when decisions needed to be made," Gould says. "This season we'll be carrying only an Apple II computer, some diskettes and a modem to download data from the DEC in Philadelphia."


But before any rush to computerized employee management occurs, there is a danger to be considered. Any new plans have to be implemented slowly and sensitively within the normal organizational structure, lest employees grow uncomfortable and frightened. As often happens when computers are brought into the workplace, people could feel that they are being watched by an electronic "Big Brother" that is out to catch their faults and mishaps and

give management reason to punish them. Sports franchises, tied closely as they are to productivity, are particularly aware of this.

Here lurks the danger of abuse

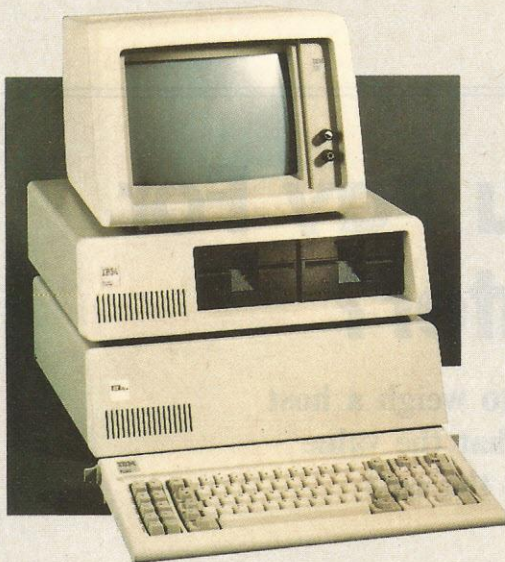
"We expect some initial resistance from the players when we approach them with bona fide data cataloging their entire season—where they slipped up and how they can improve," says Wright of the Rangers. "We're trying to correct their errors, but they might see it just as criticism. We expect a much greater reluctance on the part of hitters to accept our results. Pitchers tend to be more analytical about their jobs, perhaps because they have the luxury of reflecting on their performances over a period of days. So they will probably be more open to what we are saying. Hitters, on the other hand, don't appear to think in that way. We'll consider this very carefully as we seek corrective action."

Jan Kern, the Ranger programmer, adds: "Certainly there's the danger of abuse. Management may go into salary negotiations and say to a player, 'Here is everything you've done in cold, hard statistics, and this is all you are worth.' It takes away the human element. That's the problem with all statistics; they must be used carefully. I hope management doesn't abuse the players."

Many baseball fans have resisted the notion that the boys of summer are involved in a world of high corporate competition. But the arrival of the personal computer may be the most recent sign that baseball is a business. And before we take out our handkerchiefs and bemoan the loss of innocence, we should let Babe Ruth remind us that the innocence never really existed. When he was asked in the late 1920s how he could rationalize earning more than President Herbert Hoover, Ruth answered simply: "I had a better year than he did." And that, in baseball, as in business, as in politics, is the bottom line. 

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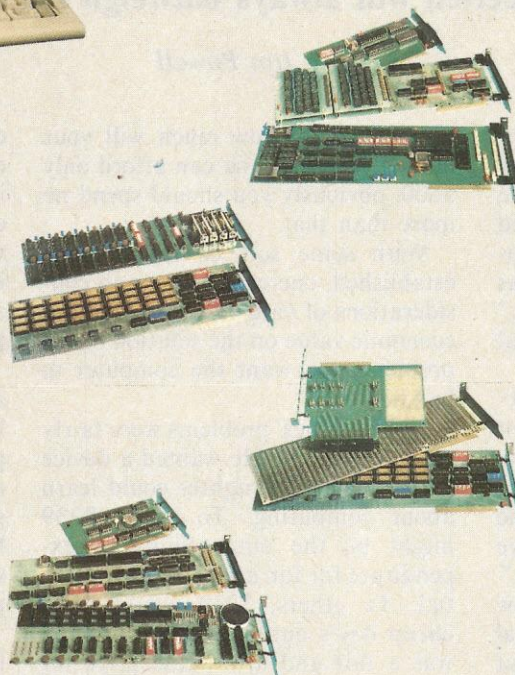
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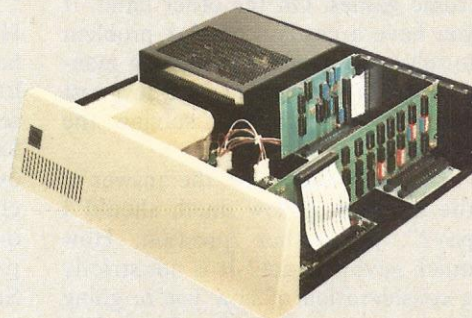
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CIRCLE 34

What Should You Pay For Your Computer?

The answer isn't simple. You have to weigh a host of factors. But you can be sure that the value received will always outweigh the cost

by Jim Powell

Robert Jones, a retired federal employee in Virginia, is delighted with his \$239 personal computer. He writes programs as a hobby and teaches his daughter about computing. "Everybody thought I was crazy spending that kind of money," he says, "but I did and I'm real pleased."

Herbert Schlomann, a Hackensack, N.J. manufacturer, spent \$8500 for a personal computer to handle payroll, accounts and inventory. "We got our money's worth," he says. "It has saved us money. I have better control of the business now."

As these examples suggest, how much you should pay for a personal computer depends on what you want it to do for you. You don't need an expensive number cruncher for electronic games. On the other hand, if you have a costly, complex problem to solve you would be throwing money away if you settled on a low-cost machine incapable of solving the problem.

In a very real sense, the answer to the question, "How much should I pay?", is another question: How much have you got? It is not strictly a consideration of how you're going to use the computer that determines the right expenditure. There is also a

big element of how much will your budget allow? If you can afford only \$500, obviously you should spend no more than that.

With some sort of fiscal limits established, one can move on to considerations of value. Can you put an economic value on the solution to the problems you want the computer to handle?

Robert Jones' problems were fairly straightforward. He wanted a device with which his daughter could learn about computing. To some, \$239 might be the outer limits of expenditure for fun and learning potential. To others, \$239 would be a cheap day's outing. To Jones, \$239 was a fair and affordable price for the value he expected to receive.

Problems cost money

Herbert Schlomann, on the other hand, had problems that were costing him money. An outside computing service was one possible solution. An \$8500 personal computer was a less expensive solution. Indeed, it was a choice that cost nothing at all, for it quickly saved more in ongoing expense than the outlay cost. As Schlomann continues to discover more things that he can do with his computer, the savings are like found money.

Many other computer buyers are having similar experiences. Some are frightened about the initial step into

computing—after all, any purchase of consequence causes some trepidation. Others dive into the purchase with freewheeling *élan*. But whichever the case there is a refreshing result: The value of the computer almost immediately outstrips its price.

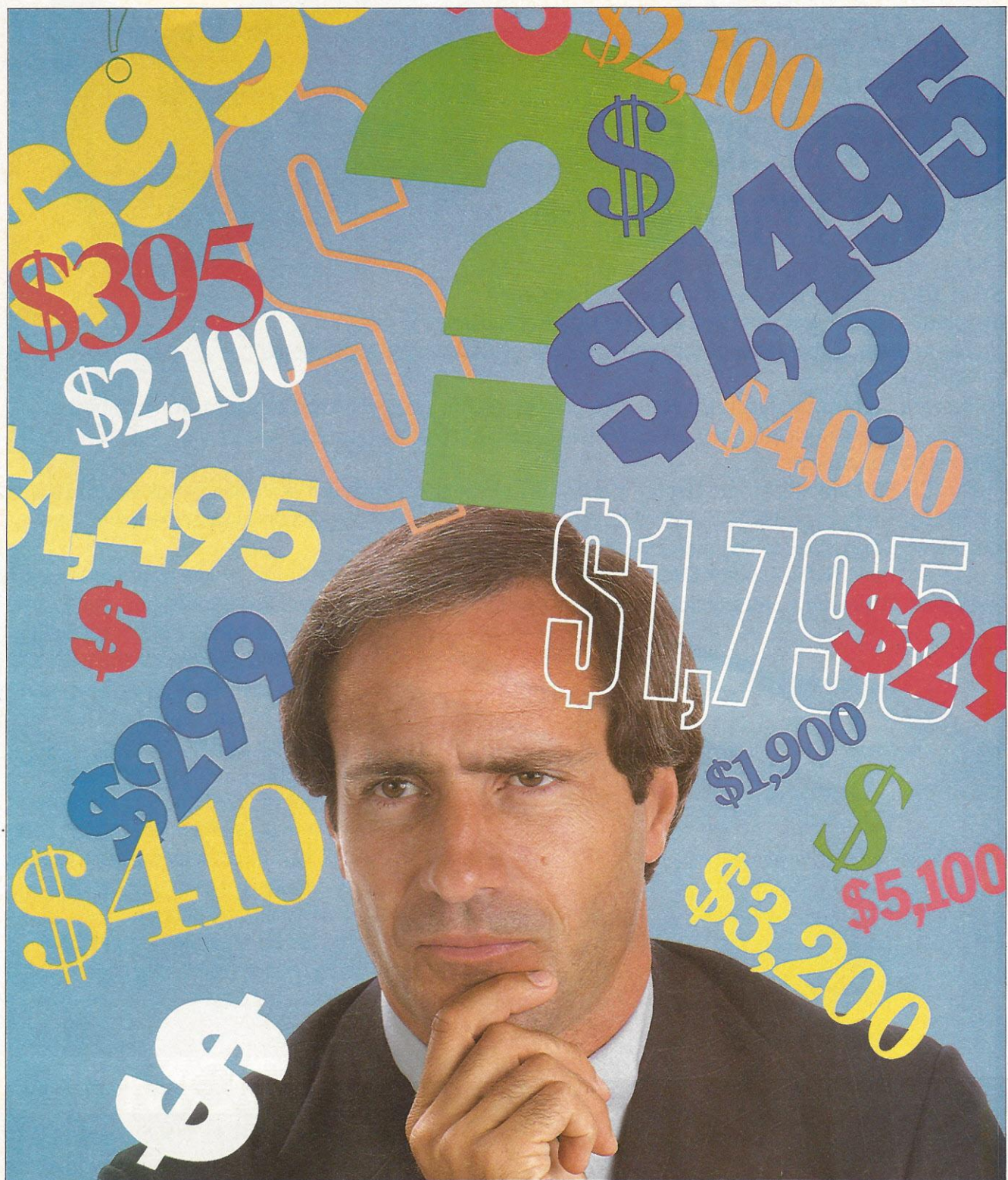
Case studies abound. Ken Rehler, a San Antonio architect, for instance, bought a \$6000 Vector Graphic computer for his firm five years ago. Six months later, an interior design program Rehler developed with it netted him a \$300,000 contract from Southwestern Bell. Rehler credits the computer for the Southwestern job.

Thus, a computer purchase that at first may be accompanied by extensive analysis becomes, in the end, simply the right choice. The computer, because of its immediate rewards, is one of the few purchases that more often than not gives the consumer tangible evidence that he made the correct decision.

Some experts have attempted to quantify the variables involved in the purchase of a computer, especially for the small businessman. One consultant claims that a personal computer can easily increase a manager's productivity by 10 percent. From that benchmark, he concludes that one measure for a manager to use when purchasing a computer could be to spend 10 percent of his salary.

"If a manager is making \$40,000 a

Jim Powell's articles on general and scientific subjects have appeared in three dozen magazines.



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A vintage portable television set, likely a Zenith 1000, is shown. It has a black and white screen displaying a person in a suit. The TV is a boxy, portable design with a carrying handle on top. The background is a solid light blue.

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“Can you put an economic value on the problems you want the computer to handle?”

year, and his productivity can be enhanced with a computer, you're talking about a \$4000 investment," says consultant Howard Anderson of the Yankee Group in Boston. "I believe this happens to be an optimal investment with current technology for \$4000. You can accomplish 90 percent of almost anything you'd want. You can get 95 percent for \$8000 and 100 percent for \$20,000."

The likely lower limit for a business or professional person? Richard Levine, the national director of management consulting with the accounting firm of Main Hurdman in New York City urges his clients to spend no less than \$2000 if they expect to use the computer effectively in the daily operation of a business.

Interesting as these figures may be—and as accurate as they may be—many computer users are shying away from such simplistic answers. The value of the computer, they say, is in what it brings to users and to their businesses. In the end, it may be difficult to specifically quantify efficiency, productivity, and enhanced creativity, but it is not difficult to bask in the improved quality and worth of one's life and business.

So the question of what you should pay for your computer is, in many ways, not one that should cause consternation. Probably, whichever computer you buy will enable you to improve considerably on what you were doing before. But there are a few salient considerations to ponder: how much you can afford, what your current computing needs are, and what your computing needs will be in the coming years. With these considerations in mind, walk yourself through the following eight questions that can help you determine what's worth paying for and where you might want to save some money.

• *What kind of software?* This is the most crucial question, since without a program a computer is just fancy scrap metal. No matter how appeal-

ing and inexpensive the hardware, it is over-priced if programs available for it don't serve your needs well.

For instance, there are dozens of business programs on the market, but if you want to computerize inventory records on 10,000 items, perhaps only three or four programs would have that much capability.

When business people need to make marketing or financial projections, there are several spreadsheet programs to choose from. The best-known, and for many people the easiest to use, offers as many as 63 columns across, 264 rows down. "I'd say these spreadsheet programs help us do our job five to 10 times faster,



Main Hurdman's Levine: Spend no less than \$2000 to use the computer in the daily operations of a business.

while improving accuracy," responds a Union Carbide manager of information systems, based in Danbury, Conn.

The simplest word-processing programs enable you to create copy, delete copy, store copy and print it. They use uppercase letters only. Such programs might do for limited amounts of copy, but they require a lowercase adapter to generate readable correspondence.

Long copy jobs call for much more sophistication—chiefly, the capability to move blocks of copy around.

Probably you'd want automatic page numbering, formatting, search and replace functions, too.

Each program involves trade-offs you should become aware of before making a purchase. Some programs are exceptionally easy to use. Some make it easy to lose copy. Good programs have built-in safeguards that protect against unintentional deletion. After you've made an error, some programs make it simple to get back on track.

"A well thought out premium-priced program can help you achieve sharp gains in productivity, and return your investment faster than an inexpensive program that might not give you all the files and other things you need," says Tim McMahon, manager of the computer division of Venture Development, Inc. of Wellesley, Mass., an electronics consultancy.

But despite its crucial importance, a program is a small part of the total system cost, commonly 5 percent to 10 percent. A letter-writing program might cost \$20, a highly sophisticated word-processing program up to \$1000, a payroll program \$200. You won't realize significant savings price-shopping for programs, but you could be sadly disappointed if the computer you choose won't accommodate the program you need.

To help select the right program, find out what programs are used by people with needs similar to yours. If you don't know anybody with similar needs, contact a computer club or ask a dealer for names. And question the dealer about the advantages and disadvantages of specific programs he suggests.

When you find a program that interests you, examine the manual carefully. The table of contents should list its features. If you don't find what you want, it's a good bet that it isn't in the program. Check to see if the manual is easy to follow, full of illustrations and concise. Often a manual is available separately

“Whatever the case, there is a refreshing result: The value of the computer almost immediately outstrips the cost.”

for \$25 to \$35, and the amount is often credited to you in the event you buy the program.

● *How much memory?* The memory area is where the work is done. Memory requirements depend largely on the software you choose and, to a lesser degree, on the amount of data you'll be working with at one time.

Memory, formally known as Random Access Memory (RAM), is expressed in terms of bytes, each about equal to a single character. A couple of kilobytes, or 2k, would be 2048 bytes—enough to fill a standard size page of typewriter paper.

According to computer consultant Robert Rinder, author of *A Practical Guide to Small Computers*, most personal and professional users can do fine with 16k to 48k memory; typical small-business users need 32k to 64k. Some small businesses and heavy users of word processing require 48k to 256k and up.

You needn't worry about exactly how much memory to buy, as long as the computer you're considering is upgradeable. A 16k memory-expanding board costs about \$150—a 128k expansion memory about \$550. The trend is toward more and cheaper memory.

Keep in mind that each computer has a limited number of slots for hooking up additional capability. If you want to hook up devices like a graphics display, you'd be better off spending more money for a single 16k expansion memory, for instance, than for two 8k memories, thereby making one more slot available.

The computer waits

Not all memory is equally fast. If a particular memory takes longer to retrieve instructions than it takes to process instructions, the computer goes into a wait mode. For a casual user, split-second delays won't make much difference. But if you anticipate heavy data processing, make a point of noticing whether the ma-

chine does its job with satisfactory speed. Generally, more expensive computers tend to have faster memories. (For a more thorough parenthetical discussion of memory expansion, see "More Computer Muscle to Power the Machine" on page 88.)

● *What kind of chip?* The heart of a personal computer is the microprocessor chip whose power is expressed in bits, the most basic data. The more bits a microprocessor can handle at one time, the more powerful the computer, and the faster your job will be done. Most low-end computers have 8-bit microprocessors, but more and more manufacturers are switching to 16-bit and a few to 32-bit. Other things being equal, you'd prefer more power.

Of course, all things are seldom equal. The program that suits your needs best might be written for an 8-bit microprocessor—a specific 8-bit microprocessor like Motorola's 6502. A 6502 program can't always be used on a computer powered with Zilog's Z80 microprocessor.

Since the most powerful microprocessors are comparatively new, there are more programs available for less powerful microprocessors. Moreover, extra power adds cost. So while power is something you'll keep your eye on, often it will give way to other considerations as you seek the best trade-offs.

● *What kind of storage?* The least expensive systems store programs and data on cassettes. This is adequate for casual users. Robert Jones raves about his little computer that "has a cassette built right into it, and I record and save my programs. It works perfectly."

If you go with a cassette system, check the quality of the cassette player. Most important: Check to be sure that the tape speed is even. You want to put your money in a reliable tape drive, and you'll want an accurate counter so you can locate data as quickly as possible.

The trend these days is away from

cassettes, because they're slow. The tape must be run through before the data you want can be retrieved, which can take 10 to 15 minutes for a single item. Less and less serious programming is being done on cassettes.


Immediate information

Business applications in particular, as well as professional applications, require speedy random access to data. Some professional applications do, too. For example, if a customer calls about an order, you'd want to be able to enter the customer's name and have the computer give you the date the order was placed, what was shipped and when—while the customer is on the phone. In this situation, a floppy disk is for you. It can do the job within seconds. Most programming available now is on floppies.

Floppies vary in their capability—storing data on a single side or both sides. A floppy can load up to 20,000 bytes of data a second versus 600 bytes a second for a cassette. So-called single-density floppies can store the equivalent of 60 to 150 pages on a side; double-density floppies, twice that much. Floppies come in 5¼-inch and 8-inch diameters, the larger size holding substantially more data.

Single sided, single density 5¼-inch floppy disks run about \$25 for a box of 10—8-inch double-side, double-density floppies, about \$40. You need extras to copy files in the event one is damaged.

If you work with a limited amount of data, a single disk drive should do the trick. But it enables you to use only one disk at a time. Editing long texts, for instance, would mean inserting one disk, pulling it out and inserting another, pulling it out and inserting another—a distraction. Probably you'd be better off paying more for a double disk drive. Moreover, copying disks is easier with a double disk drive. And if one drive



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malfunctions, you can continue operating with the other.

At the low end, you have single disk drives capable of accessing data from a single-sided disk. They run about \$400. A double disk drive that can accept double-density disks costs about \$1000. Superior quality drives can exceed \$2000. Better reliability is the benefit here, since a drive is a common source of malfunction.

You always want more

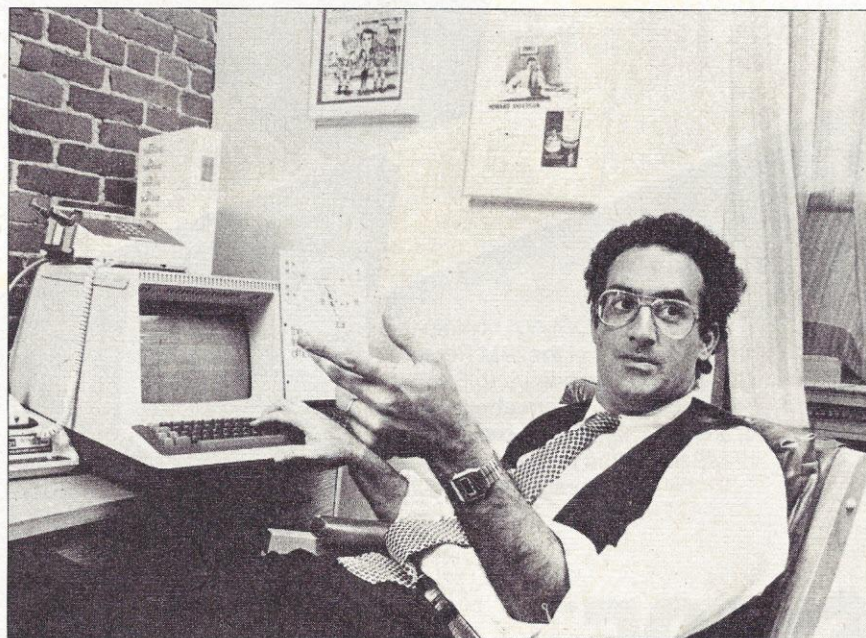
Probably you won't need more storage than floppies can provide, but if so it's available via hard disks. Built into a computer, a hard disk contains up to 40 million bytes of data. Typically it's powered by what's called a Winchester drive. The package can cost a couple of thousand dollars more than a floppy system. "Yet people always seem to want more memory, or more powerful microprocessors and more sophisticated programs on their personal computers," says Venture Development's Tim McMahon. "I believe hard disks are the wave of the future."

● *Is the keyboard easy to use?* Some keyboards are easier to use than others because of the way keys are arranged. The aim is to locate all keys within convenient reach. A small amount of difference can create a grating annoyance.

Most important is location convenience of the cursor-control keys, the control key and the escape key. Ease of access—speed—is the consideration here.

"The location of the delete key can pose a danger," warns Phillip Good, consultant and author of *Choosing a Word Processor*. "If it's adjacent to a commonly used key like shift, you could lose a half-hour's editing as a finger hits the wrong key."

Check whether there's "key-bounce," a tendency to produce two characters when the key is depressed once. This can really slow you down. The small size of some keyboards



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prevents you from typing quickly. So you're forced to hunt and peck, a distinct disadvantage for a personal-computer user intent on large amounts of word processing, but possibly not a consideration if accounting is the computer's central purpose.

● *What kind of monitor?* For casual use, save your money and buy a personal computer that hooks into your TV set. Potential disadvantage: an image that isn't as sharp as a computer monitor.

The admirable monitor

If your requirements are limited to computing, a small monitor, several inches square, should serve admirably. Word processing or work involving columns of figures calls for an 80-character-wide monitor. Most computer users are happy with a monitor 25 lines high, about a third of a page.

Compare monitors and you'll see that some are much more readable than others. A poor quality monitor means mushy characters and odd,

hard-to-read typefaces. Better monitors give you crisp, clear characters with typefaces more like those you see in newspapers and magazines.

If you work with a lot of text, you'll want a monitor that displays both upper- and lowercase letters, because an all uppercase format is harder to read. All uppercase is adequate if you work mainly with numbers.

You can choose monitors with white characters against a charcoal background, green against charcoal or full color capability. As you might expect, full color costs several times more, and you'd need it only if you do a lot of work with graphics.

If possible, get a monitor with a fast refresh rate. This means characters appear and disappear as soon as you hit the appropriate keys. When characters are slow to fade, especially as you scroll up or down, your eyes can become fatigued in minutes.

● *What kind of printer?* Because it
(continued on page 185)

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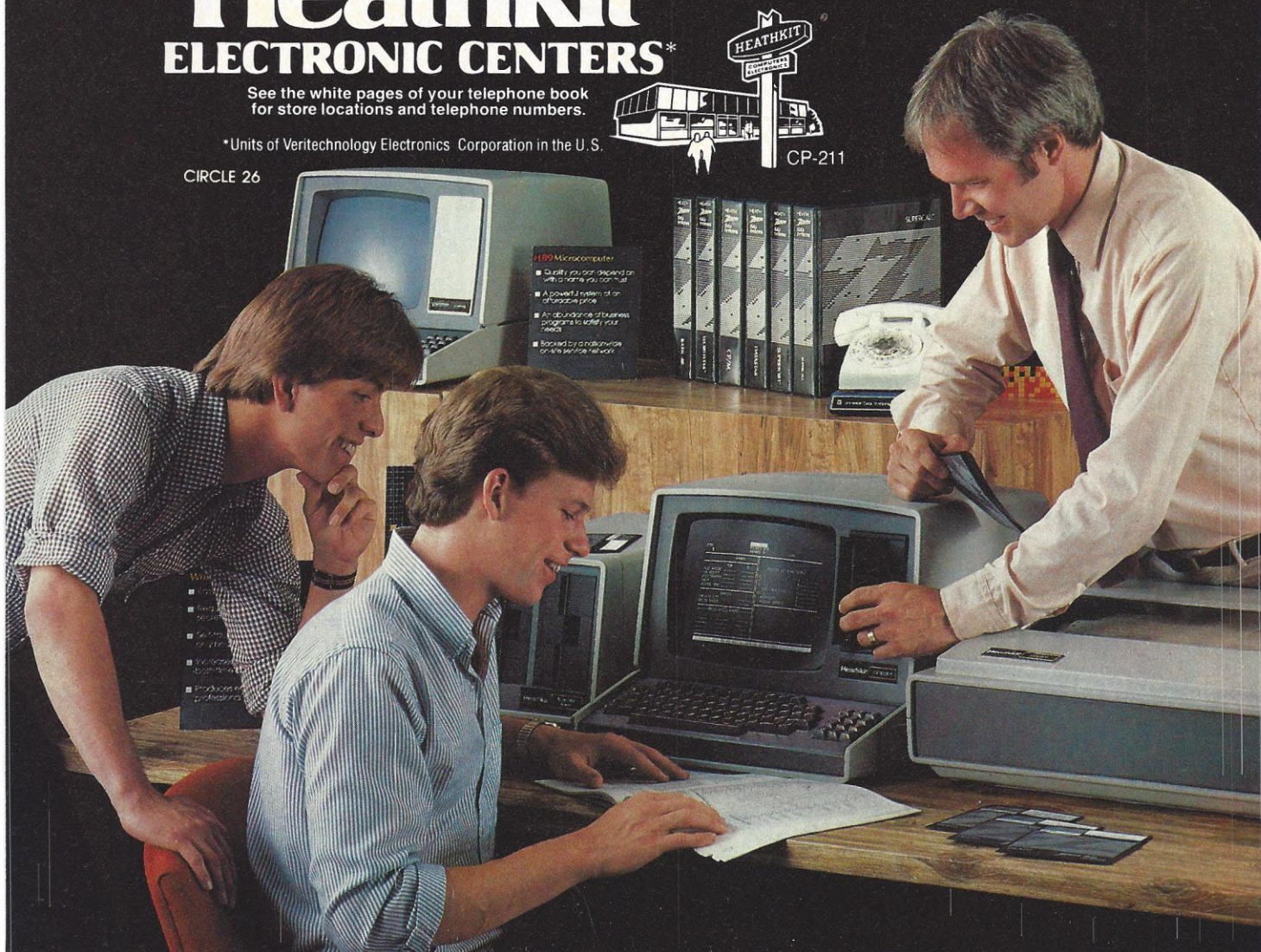
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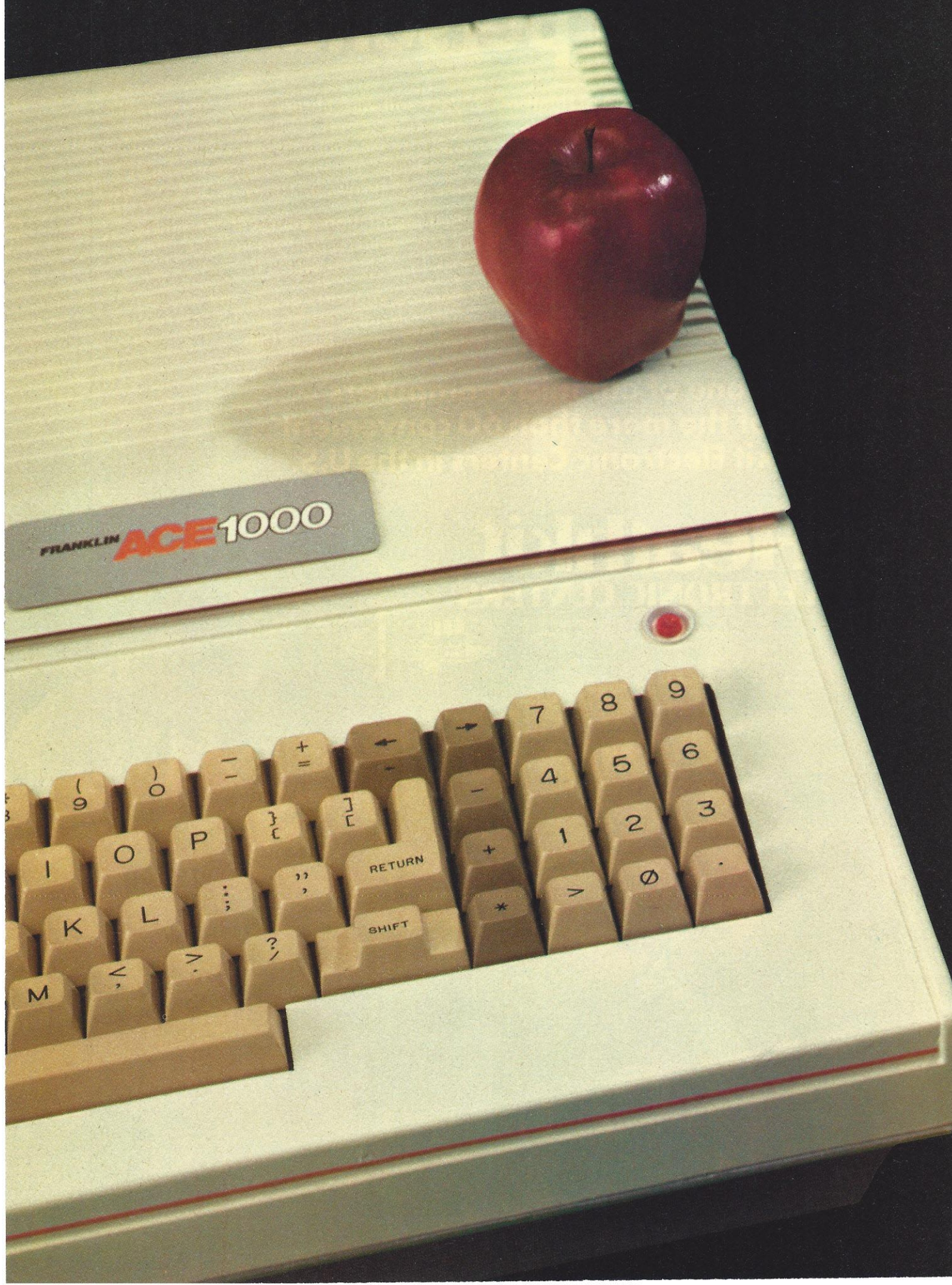
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CIRCLE 163



Hand-Held Computers: More Than A Curiosity

Hand-held computers have often been dismissed as glorified calculators. But now, as these small machines are being used for everything from inventory to quality control, they're taking their place among the computing giants of the past few years

by Richard D.R. Hoffman

A small revolution is underway in the personal-computing world as hand-held, or pocket, computers, are communicating with desktop systems.

While small correctly identifies the physical size of these miniature mainframes, they are, in fact, equivalent in computing power to much bigger machines of only a decade or so ago. Today, people are finding low-cost portable power to be effective in remote data collection and in applications that extend the reach and effectiveness of personal computers.

The applications—many not yet available to the public—include inventory- and quality-control systems, sales, cost accounting, financial systems, measurement, and scientific and engineering systems. Hand-held computers from Hewlett-Packard and Panasonic already are in place in some applications interfacing with a desktop system. Others from manufacturers such as Radio Shack and Sharp, (which manufactures the Radio Shack hand-held computer as well as its own) expect it won't be long before they, too, see similar applications.

Growth of hand-held computer use has been swift, even for the fast-paced technical world. Richard Nelson, president of the non-profit Per-

sonal Programmers' Club, Inc. dates the birth of the personal-computing industry at January 1975, when the HP-65 scientific calculator was introduced. Nelson's organization began a year earlier and now boasts 5000 members from 55 countries in 35 chapters around the world. He touts it as "the oldest personal-computing users' group in the world."

Nelson takes a somewhat chauvinistic attitude toward definition of the personal computer. "It's something you can carry with you, 24 hours a day if you want, something that becomes part of your everyday activities." Although most of us would define "personal computer" in broader terms, the hand-held units currently available do function as Nelson describes. And more.

Hand-held computers began communicating in the minicomputer and mainframe environments. At the time there was a lot of that kind of hardware in place, and the programmers available were familiar with minicomputer and mainframe environments, but not with personal computers. Hand-held data terminals, first cousins to hand-held computers, had been used in remote data-collection applications for years prior to the advent of the pocket computer. Such terminals are usually programmed for dedicated applications as pure one-way data-entry devices with limited peripherals and little or no independent computational capability.

But the hand-held terminals have increased in sophistication.

An up-and-running application involving a Telxon model 787 portable transaction terminal and an IBM System 38 at Agnew Surpass, Inc. of Brantford, Ontario, Canada, is a good example of both hand-held data terminals' sophistication and their use with minicomputers.

Agnew Surpass, part of the Genesco Group, Inc., recently became a 325-store Canadian shoe chain in July when it acquired Dexter Shoes, a former competitor. Prior to that expansion, Agnew Surpass had placed Telxon 787s in 210 of its retail outlets for one-way communication of data for a variety of applications, including point-of-sale (POS), payroll, inventory control and order entry.

The investment of over \$1 million was seen at that time as more desirable than installing POS cash registers costing \$8000 to \$10,000 at each store. Before the choice was made, the company was experiencing incomplete and late computer runs of sales and marketing reports on Genesco's System 38 in nearby Cambridge, Ontario. Erratic mail deliveries, some taking as long as 10 to 14 days to reach Cambridge from the stores, and keypunch operator difficulties in reading illegible sales slips and summary sheets, caused Agnew Surpass to consider automating the system.

Richard D.R. Hoffman is a freelance writer who covers the computer and electronics industries.

“Growth of hand-held computer use has been swift, even by the standards of the fast-paced technical world.”

Using software developed jointly with Telxon, sales data from each store's receipts are entered daily onto the 787s through interchangeable French or English keyboards. The process now takes about 20 minutes, instead of the hours it took with a manual system, noted Jake Mulhaus, vice president and chief accounting officer for Agnew Surpass.

Smaller scale problem

Jim Kilduff, owner of James E. Kilduff, Inc., a 30-year-old produce wholesaler in Everett, Mass., wasn't talking in millions when he tried to solve his remote order-entry problem, but he wanted to save time. He bought a \$25,000 order-entry system from systems integrator New England Data Systems, Inc. That includes 18 Telxon 716 data terminals at \$450 each, an Apple II Plus with 48k of RAM, a Novation 1200-baud modem and an Epson MX-80 printer.

Sixteen of the greater Boston area supermarkets Kilduff services use the terminals to transmit their orders between 3:30 p.m. and 7 p.m. Each produce item Kilduff carries has a four-digit code that the customer enters onto the 716, along with the quantity desired, and then transmits over the telephone line via an acoustic coupler.

The system saves Kilduff and his two sons about six hours each day of manually transcribing telephone orders. Once the orders are in, the Apple begins processing and prepares the picking orders for the next day—important because the Kilduffs' day begins at 2 a.m. The Apple also prepares daily and weekly reports on sales and orders.

Kilduff says the only continuing problem he has had with the system has been a malfunction that causes the computer to go down when a customer dials it and makes a transmission error. “If they push the send button and don't have the machine turned on when it's in the coupler, or if they suddenly disconnect the cou-

pler immediately after calling in the orders, the Apple gets hung up,” Kilduff says.

So the Kilduffs have to constantly monitor the Apple to restart it and receive other orders. But that seems a small price to pay for the time saved and reduced telephone usage everyone on the system is experiencing.

It seems that remote order entry can certainly save time—and time, as they say, is money. That's why Tom Alires, branch manager of AMFAC Corp's drug wholesale operation, is installing a 24-hour-a-day system at a distributor in Indianapolis. Such a system has just finished testing in Albuquerque. This system uses hand-held terminals too—these from MSI Data Corp—connected to an Apple II over telephone lines. The Apple in this case serves as a sort of preprocessor for a mainframe computer. It prepares a disk that transfers the information onto tape for use with Burroughs batch-mode computers. The Apple doesn't have the capacity for the kind of processing AMFAC needs.

Praise for flexibility

Alires praises the system for its flexibility. “We have enough diagnostics built in so that we can recover all but a small percentage of garbled transmissions,” he says, a common problem with telephone-line transmissions. “The complete edit capability we have, by item and order, allows us to reconstruct an order file completely.” Salesmen also carry MSI units and can expedite an order from a new customer.

Controlling errors and saving time and money are the big selling points of the hand-held data terminals. But when it comes to applications that require computational capability, the hand-held computer adds that feature—as well as two-way communications with the host computer.

There's an analogy between the world of personal computers and hand-held personal-computing de-

vices and the world of minis and mainframes. Hand-held terminals and computers offer distributed data-processing capabilities to the personal computer, as does the intelligent terminal (or a personal computer itself) to the mainframe and minicomputer.

Like a smart terminal

But the data terminals function as “dumb” store-and-forward terminals with minimal computational and no processing capabilities. Having a hand-held computer, though, is more like having a “smart” terminal on a network, or a personal computer itself.

The analogy comes alive in comments from Kirk Gregory, director of engineering from Symons Corp. of Peoria, Ill., a large manufacturer of concrete forms and ties for the construction industry. Gregory is considering using the Panasonic hand-held computer with 4k of memory as a field-engineering tool. With it, branches and divisions worldwide could access engineering data, such as structural and beam analysis, from Radio Shack TRS-80 Microcomputer Model IIs via telephone.

“We set up the Panasonic HHC here in our office with its telephone modem,” Gregory says. “We put the Radio Shack II into host mode, transferring control of the computer to the peripheral, hooked the Panasonic HHC to it and a monitor, and watched the two of them talk to one another. We listed, ran and modified a program over the system.”

Gregory likes the portability of the Panasonic system, and its modular design. “The nice thing about it is you can buy it in steps,” he observes. “The HHC is about \$400, and then you can add peripherals to it as you go.”

Since Symons does a lot of rental business, Gregory says, the HHC “ultimately will be programmed for sales people to use for logistics and shipping purposes. With this system it's possible to do estimates and on-

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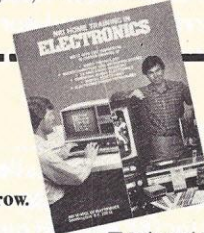


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"People are finding portable power effective in remote data collection and applications that extend the reach of personal computers."

the-spot sales quotations, as well as discover whether an item is on the shelf or back-ordered in order to set up delivery."

Gregory adds that he would have liked to use the Radio Shack PC-1 or PC-2 and keep to a single source. "But they tell me they're not yet capable of such applications and won't be for a year. And I don't have a year to wait," he says. Radio Shack has announced as RSS-232-C interface that would make it possible for the PC-1 or PC-2 to communicate with other computers. But the interface won't be available, a Radio Shack spokesman says, until January 1983.

Meanwhile, Randolph and Associates, a civil-engineering firm in Peoria, is using the Panasonic RL-H 1400 hand-held computer in conjunction with a Campbell Scientific CR-21 special-purpose computer in a study of the effect of sewer overflows on the quality of the Illinois River.

Dan Good, an engineer with the firm, explains that a sewer is equipped with a regulator—essentially a hole in the bottom of the sewer pipe—that allows effluent to drop to a lower-level pipe that transports the sewage to a waste-treatment plant. During storm periods, however, large volumes of water force the effluent to override the regulator and waste matter is discharged into the river.

Off for the week-end

The Campbell CR-21 is installed at 10 strategic locations along the sewer system to monitor the effluent quality and quantity, providing information that signals when corrective measures should be taken. Data from the CR-21 were formerly transmitted directly over the phone lines to a time-sharing service in nearby Morton, Ill. "But that became a problem," Good says, "because the time-sharing service shuts down over the weekend."

To accomplish constant monitoring, Randolph decided to use a

Panasonic RL-H 1400 with a resident 4k of RAM. The hand-held computer collects data from the CR-21's sensor and checks its batteries from a remote site via Panasonic's acoustic modem over the telephone lines. The data are then sent, again over telephone lines, via a 1200-baud Racal-Vadic modem that plugs into an RS-232-C interface, to the time-sharing service where graphs, flow tabulations and other reports are produced. Panasonic's Telecomputing 2 software module that plugs into the back of the RL-H 1400 controls the communications.

Going home in a briefcase

On weekends engineers monitoring the sensors take the Panasonic unit home with them in its custom briefcase. That also transports all the peripherals that make the application work: an extra 8k of memory, the RS-232-C serial interface, a 40-character thermal dot-matrix printer, a TV adaptor for graphic display and a battery charger. Good says the entire system costs about \$2300, including software.

We're still writing software for the application," Good says. "We're just beginning to do software for other municipalities. We think the system is excellent for any kind of monitoring or quality-measurement application, and it's handy because it communicates over a standard phone line."

Panasonic also offers two other models of hand-held computers with 2k or 8k of RAM, as well as 4k, 8k and 16k memory modules, a BASIC compiler/interpreter and several other plug-in telecomputing, program-development and application modules, plus several other peripheral items.

Hewlett-Packard offers a similar array of peripherals and basic units, and likewise has its pocket computers involved in a variety of applications linking them to larger computers.

HP-41s are being used, for exam-

ple, in a quality-control role in a system developed by Cameron Computers of Rochester, N.Y., in conjunction with Xerox. Cameron responded to a new quality-control program Xerox is setting up with its more than 1500 suppliers of components and precision parts.

Communicate with ease

The program involves on-site quality-control reports from each supplier who decides to join the program. Suppliers submit their reports to Xerox for review and certification. Once certified, parts go directly from the supplier's production floor to the Xerox production line, saving Xerox costly incoming inspection.

Cameron's solution automates the program for Xerox suppliers. It costs about \$6000, including software, and uses a HP-41 with 2.2k of on-board memory, expandable to 6k, and the HP-85 personal computer with tape drive and printer. The system communicates through HP's recently announced HP-IL converter, which includes the interface to allow the 41C—as well as the brand-new HP-75 hand-held computer—to communicate with any of the HP Series 80 desktop models.

This system is currently in use at the Alliance Metal Stamping division of Alliance Tool Corp. of Rochester, the first Xerox supplier to bring it on-line. Don Fletcher, a quality-control manager at the plant, says the application has only been running about eight weeks, but there have been no difficulties with it in that time.

Fletcher explains that quality-control inspectors use the HP-41C as a hand-held data-collection unit on the Alliance production line. They enter dimensional data on manufactured parts. Then they bring the computers to an inspection laboratory where they dump their collected data to the HP-85 through the HP-IL interface loop.

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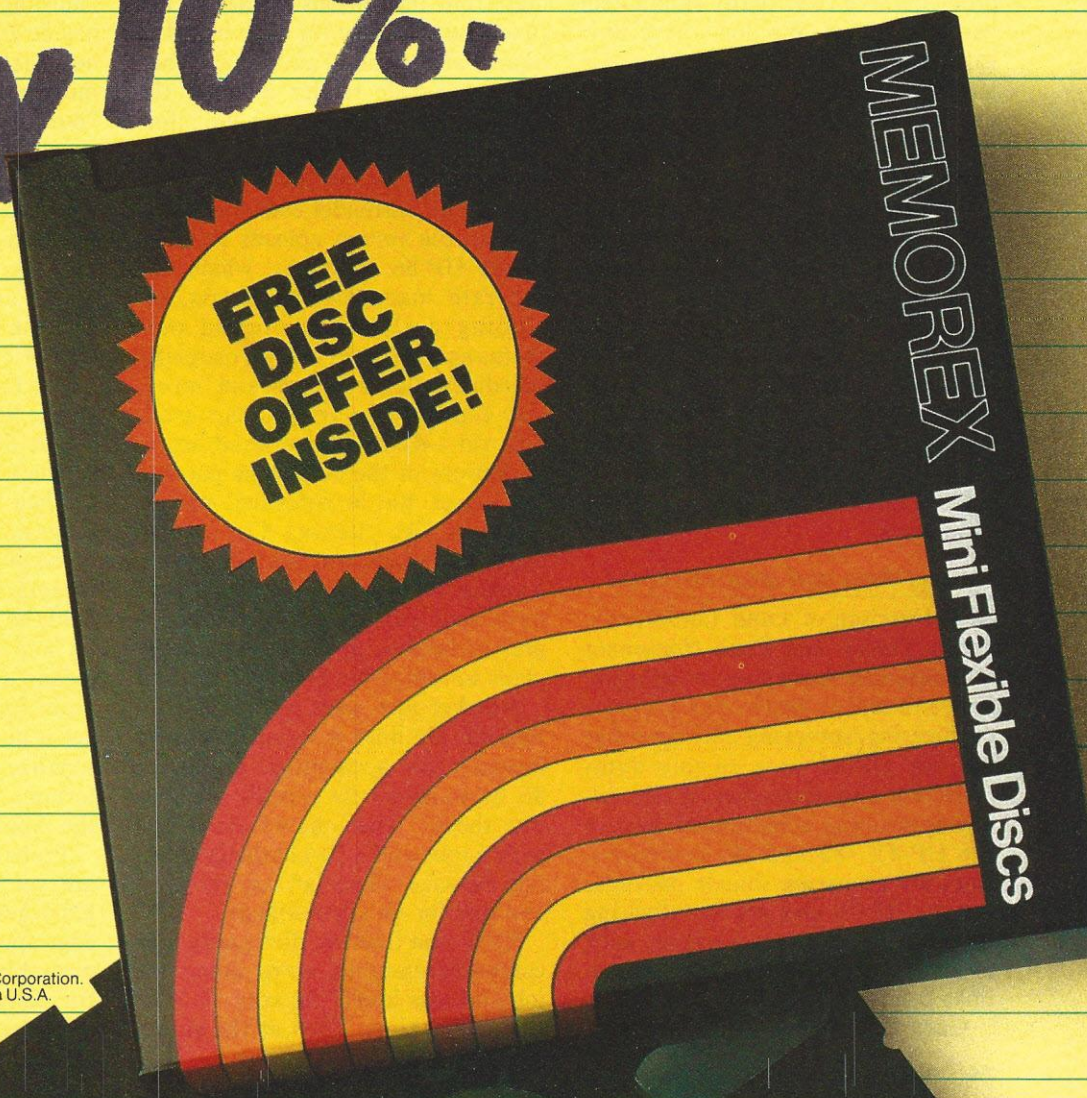
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“Having a hand-held computer hooked to larger computers is like having a smart terminal on a network.”

charts—all relating to a part's tolerances and quality—are then produced on the printer. After collecting and evaluating data from 26 separate samples on five components each from the production run, Alliance sends the information to Xerox for certification of the part.

“With this system,” says Fletcher, “we can establish the upper and lower control limits and fine-tune a particular part within the allowable tolerance band. This allows us to consistently produce parts of high quality. We have a quality tool that involves more inspection time up front but saves a lot of time that would otherwise be lost because of dimensional problems. We've virtually eliminated part reworking. We don't have any valid data or statistics yet, but we have observed an upward trend in quality and less downtime on the production runs due to quality-control problems.”

The availability of the HP-IL interface has spawned a lot of interest from systems integrators (people who put together a computer system designed for specific applications, like Cameron Computers) and consultants around the country. Many have developed software that works with the HP-IL to interface both the HP-41 and the newer, more sophisticated HP-75 with larger personal computers.

Collect data and monitor booze

Rick Harrison of Land Innovations, Inc. in Dallas, and Keith Houseman of Houseman Associates in Houston, for example, both have civil-engineering/surveying packages that use the HP-41 as a remote data-collection and computing device, allowing two-way communication with the HP-85, -86 and -87 computers. Both are preparing similar packages for the HP-75 and are investigating software for other professions, such as sales, that will allow similar uplinks from HP hand-held computers.

Gary Goelkel, of Profit Manage-

ment Systems in Fort Lauderdale, Fla., has developed a unique application for Dave Reilly, president and owner of Electro Data Systems. Reilly has developed a special pourer that fits on liquor bottles. The spout has a built-in microprocessor and light-emitting diode (LED) display. It can automatically monitor how many units of liquid have been dispensed from a bottle and how many times the spout is moved from bottle to bottle.

Goelkel developed software around this innovation, creating a system that uses the HP-41, the HP-IL and a HP-86 personal computer. With this system, managers can take readings from the various bottles in use (one pourer is used for each brand of liquor) at the end of each shift. They use a bar-code reader to enter the brand, and manually enter the information displayed on the LED display. They also enter the bar location, station and bartender code manually.

Then the system uploads the data to the HP-86 computer, which can generate management reports, including daily usage, brand performance, delivery and ordering schedules, liquor trends and inventory control. The system isn't available yet—Reilly has suffered delays in delivery of the chip to be put into the pourer. But he notes that concessionaires like Stevens Co.—which runs concessions at Churchill Downs, Yankee Stadium and several large bars and restaurants—have expressed interest in the system. Reilly plans to rent it for \$300 per month.

Goelkel also uses an HP-41 for himself. He links it to an HP-86 for internal cost accounting. Using the 86 he transfers the week's schedule into the 41. Then the 41 alerts him with a tone and a 24-character flashing message when he's on the road and due for an appointment.

“If I don't tell it differently, the computer assumes we're doing the job and logs it off,” he says. “I enter the ending time. Then at the end of


the day or week I transfer the data back into the 86, which then uses it for job costing. And I can still use the hand-held unit for computation without disturbing the program.”

Leaving the business nest

While most of the applications linking hand-held and larger computers today are in the business world, it probably won't stay that way. P.M. Weaver Associates, of Charlotte, N.C., has created a service that should let hand-held computer uses proliferate. Executive director Mike Weaver and designer Jim De Arres created an EPROM (Electronically Programmable Read-Only Memory) “burning” process for the HP-41 that has developed into a worldwide business that Weaver says has grossed \$1 million in just six months. (EPROM “burning” is the process of writing a program onto the device.)

Weaver has a patent pending on the process his Hand Held Products Division is offering. The process allows users to develop programs on the HP-41 and then send those programs over the HP-IL to any of a number of CP/M computers, including the Osborne 1, the IBM Personal Computer, the Radio Shack Model II and the Xerox 820. That computer then reproduces the program on disk.

Then Weaver's system reduces the program to EPROMs. Sixteen k can be burnt onto three chips. A special receptacle attaches to the HP-41 to hold the chips, which expand the unit by a possible 32k of ROM. This means anyone who can write a program for one of these computers can get it put into a module to truly personalize his machine. Panasonic is offering a similar development tool for the Apple II for use with its HHC.

Probably thousands of applications are yet to be thought of for small, hand-held computers. The leading-edge applications mentioned here will probably not remain leading-edge for long as the small revolution continues. 

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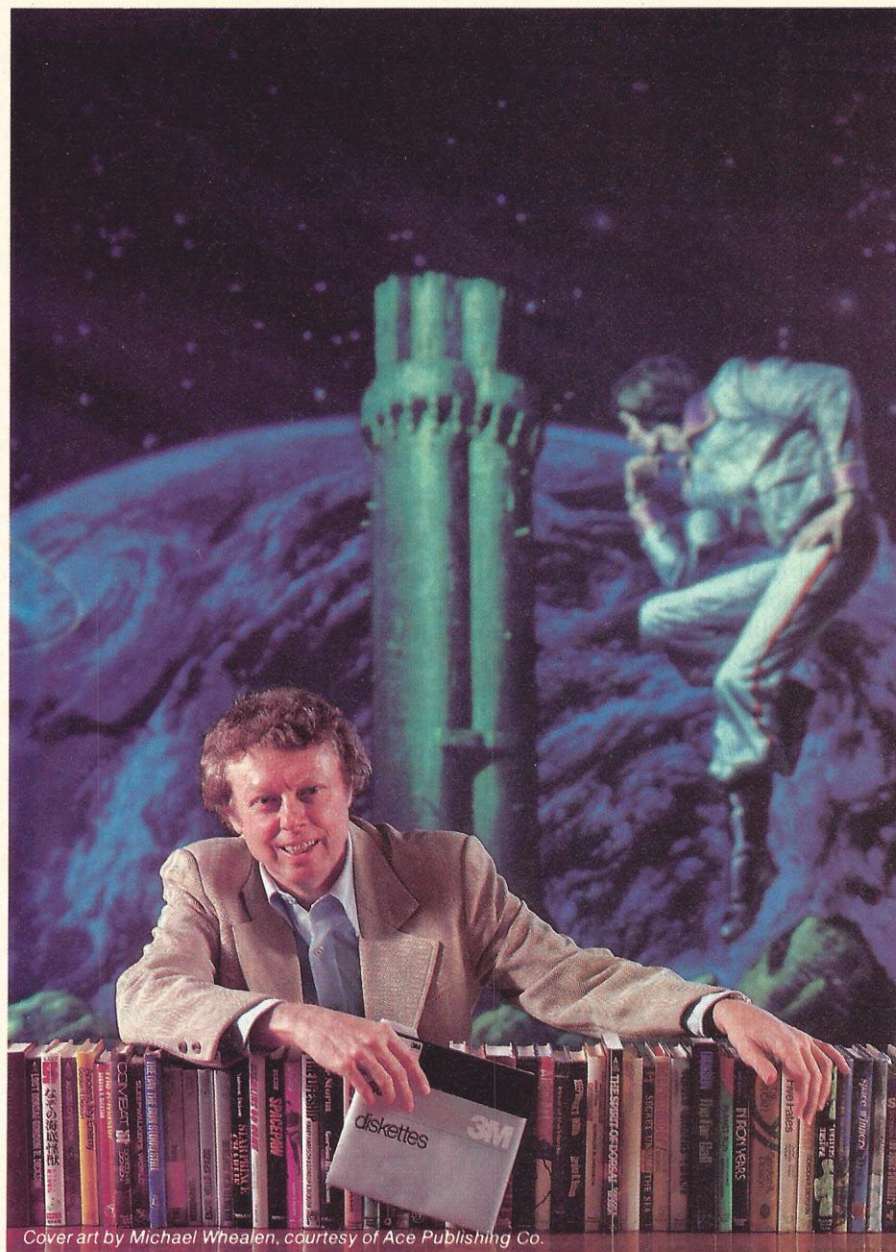
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When Personal Computing Becomes Impersonal

That line is drawn when the institution, not the person, makes the decision to compute. When we asked personal-computer manufacturers about their own computing, we found that it's not all personal

by David Gabel, Senior Editor

The shoemaker's children are the ones who have no shoes. "I'm one of them," says Carrol Leu, vice president of data processing for Tandy Corporation, the manufacturer of the TRS-80 Microcomputer. "When it comes to getting something programmed on my mainframe computers, I take the lowest priority. That's OK; I don't want to waste the time on that computer when my Model III does VisiCalc for me."

Leu is one top executive in a personal-computing company who understands the utility of personal computers—what they can do well, and what they can't do. "We use them all over the place here," he says. "I'm all for it. Even if I weren't at Tandy, I'd be for it. It's the way to go."

Leu is unusual. He understands the difference between using computers to accomplish personal goals—whether they're business-oriented or not—and using computers for the goals of the organization. The former is personal computing. The latter could be called institutional computing.

There is a big difference. When people do personal computing they're operating with high efficiency because they are using a productivity-enhancing tool as they want to use that tool. There's no coercion, so they

learn all they can about that tool to get the most they can from it. They say things like, "Well, I'm going to use my computer today to get my budget done early." And they will get it done early, and then move on to something else. That's productivity. That's personal computing.

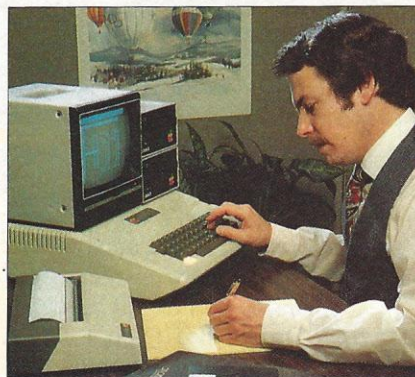
Yeah, but . . .

Too often, though, something else happens. Organizations impose equipment from above. They tell the employees that they will use a particular style of work, or a particular kind of activity, or a particular kind of tool. Some organizations even decide what kind of equipment people at different levels in the organization

will have—down to the chairs the people sit on, whether the chairs function well or not. That's institutional sitting. And if the organization does that with personal computers, it has to be institutional computing. Then people are prone to say, "Oh, darn it, I have to learn how to use this thing. The boss said I have to, and I know what will happen if I don't."

Radio Shack's Leu seems to understand the distinction very well. He has a unique solution to the old problem of the unresponsive data-processing department. "You know, you've got a lot of users out there, and you just can't really service them all with your mainframe. Some of the smaller users can wait and wait to get help. Well, what I do is send a junior programmer out, if the application is a relatively simple one—one that the personal computers can handle. The programmer can write an application for a Model II that can take care of the user's needs. That solves the problem." So Leu uses his computing institution—his data-processing department—to further personal computing inside Radio Shack.

Leu also uses a personal computer himself—in this case a Radio Shack Model III—to do his budgeting. "I used to spend weeks getting the budget together, trying to get stuff to balance and such," he says. "Now I



Apple's Phil Roybal: I was one of the first managers to move toward computerization in my department.

change one entry and the computer makes all the changes that come from that. Why I can justify my computer with just that one package. But then, too, there are some things that I work on that I just wouldn't want anyone else to see. I can use the computer for that, too."

That's personal work. So Leu is doing personal computing. The only institutional aspect of the work he's doing is the brand of hardware being employed. Some concessions, after all, have to be made to a company that makes computers. But Leu also helps people with their personal requirements. And he sends people out to help them find solutions they can use on their personal computers. The personal and the institutional each work in their proper sphere. People and corporation work together.

Ed Esber says people at VisiCorp work that way. Esber, a product manager for the VisiCalc publisher, says he uses personal computers, mostly at home. "In product marketing," he says, "it's tough to get away from the phones and the meetings." So he and others have been able to justify keeping a personal computer at home to work away from the brouhaha.

Esber, who was the eighth or ninth employee at VisiCorp, which now boasts about 150 employees, catalogs the uses personal computers are put to at the company.

"I use VisiCalc for sales forecasting, pricing and gross-margin calculations," he says. "But the most used program here is VisiSchedule. We use it in the marketing department to do manpower loading and budgeting.

"The financial guys use personal computers for accounts receivable 'what-ifs' and stuff like that—stuff like budget projections vs. actual experience. We do a 12-month plan every six months here, so everyone uses a VisiCalc template to do that. Of course the secretaries use a variety of word-processing programs.

"Almost every professional here

has a personal computer on his desk. That's almost company policy. We believe our products are productivity enhancers; that's how we use them."

Esber says that about six months ago most of the computers at VisiCorp were Apple IIs, but now the IBM Personal Computer is gaining. That could cause a problem of file compatibility between the machines, but Esber says it hasn't so far, because, "different departments have different pockets of machines. I suppose the tech guys could fix the file-compatibility problem if they need to, but so far there's no need."

VisiCorp's people use personal computing to help in personal activ-

puting for themselves that make this fit into the category of personal computing.

But when clerks make up the next payroll, it's all for the company, except for the clerk's own pay, of course. VisiCorp does its 150-person payroll another way.

"Actually, the Bank of America does our payroll," says Esber. "Other institutional needs are handled by minicomputers. We have a data-processing department that runs an HP-3000, and that's used for things like order processing and the like. Much of our product development is done on a VAX 11/780 (a computer from Digital Equipment Corp-



Lynn Gibson is one of the programmers charged with keeping Radio Shack's Store Operating System, a network of retail stores connected to headquarters, up and running.

ities. When a financial type sits down to decide what will happen if receivables age past 60 days, it's a very personal thing. He has to make his assumptions very carefully, decide what weighting to give certain factors, and determine what the effect of various possible corrective remedies might be. Same thing with a product manager who's trying to decide when the new package will make it to market. These people are all using the computer to help them in their jobs. The result will help the company, but it's the people who are doing the com-

oration) using cross assemblers, (which are programs that turn personal-computer code into VAX code for running). And much of the documentation is written on the VAX. Of course, lots of the terminals on the VAX are personal computers. The folks use them as intelligent terminals."

The other way

It can be different. Even in the personal-computing companies, the organization can turn out to drive the

people, instead of having things the other way around. It's too bad when that happens. The goals of the institution are surely met, but what about the people?

IBM is the company in the computer business that's looked on as the leader in institutionalizing the individual. People in other companies love to tell about singing the IBM fight song at company sales meetings. And the requirement to wear white shirts, dark suits and conservative ties is legendary—but still carries over today. Surely, the IBM Personal Computer has changed that?

Well, maybe it's beginning to. Mike Pruitt is a professional electrical engineer who works in the IBM facility at Raleigh, N.C. They make data-communications terminals, modems and other communications gear. Pruitt doesn't get involved in making the product or in running the production lines. He keeps the plant going. He uses an IBM Personal Computer.

"I work with the high-voltage systems here," says Pruitt. "It could be the air conditioning systems, some control system or something like that. I had the opportunity to cost-justify a computer, and so we got one. We got one about three months after they were announced." (We got one? Who got one? Is this personal computing?) "There was only one computer in facilities engineering," Pruitt continues. "I was the coordinator of the effort to get the personal computer here. I cost-justified the one, and now our function has been able to justify another."

"I use VisiCalc or IBM advanced BASIC. For example, I wrote a materials-estimating program. When we want some contract work done we get bids from various contractors. Then we can check the contractors with this program. We can scroll all the materials past on the screen and add or delete as needed. That's after we've accessed a file and keyed in the labor costs and things like that. The

program is such that the particular user just puts in a data disk and turns the switch. The program does the rest for him. So we can check the bids the contractor submitted, using this program.

Energy audits

"We're also doing audits of our bills—electric, water and gas. We used to have a girl auditing the bills as they came in. So I wrote a program in BASIC that goes through the list of things on the bill, and asks questions as you go through it. It's easy to update that way. We have so many utility bills that it was taking 180 hours per year just to audit the bills that came in. That function is now taking only about 36 hours.

"I'm also using VisiCalc in engineering. I've compiled a long list of all the breakers and their ratings in all the substations at the plant here. Now we have a Series/1 (an IBM minicomputer) system that monitors the power demand on the substations. I put those figures into the VisiCalc program that takes the ratings and compares them with the highest demand. It tells me the loading on the transformers.

"I can use that too, to predict the demand that a building will use. We have company standards for the amount of power a building will use depending on the type of activity in areas of the building. We use two volt-amperes (the product of the current delivered and the voltage at which it's delivered, a measure of electrical energy) as the lighting load in an office area. There are other factors for other type areas, like computer rooms, drafting rooms and such. We can change those figures if we have reason to. Then we put all this into the VisiCalc program, and it will figure out what the total load and energy delivered, in kWh (kilowatt-hours), for a new building will be. Then we use that figure for our contract with the power company.

"I've fixed the program so I can

change the figures in one block of the program, and all the dependent variables in every other block will change, too. We brought the power company officials in here and showed them how the system worked, and they were impressed. So where before they would estimate how much power the building would use, now they use my number. It's that close to the actual experience we've had.

"We do a lot of things that are just repetitive, too," Pruitt continues. "And the secretaries also do word processing."

If Pruitt didn't keep saying "we," you'd almost think that it was "his" computer, and not the company's, or his "functions." He and his contemporaries probably don't even think of it on those terms. Wouldn't it be great if they did—if Pruitt called it "my" computer?

Not the only one

He's not alone, though, even in the personal-computing companies. People use their computers for themselves. And they do very well. But the institution keeps getting involved. They keep saying there are no typewriters; that's how much we think of the personal computer. Perhaps what they should be thinking about is how different their lives are since the personal computer.

Consider the case of Diane Le Bold. She's the editor of *Power/Play*, a publication of Commodore International for users of the VIC-20 computer. She wants to use her computer to do word processing on the stories that will appear in her magazine, and then send the stories directly to a typesetting shop in St. Louis where they will be made into a form suitable for photo reproduction and composition into a magazine. She can't.

"You'd think," she says, "that with all the programmers we have around here, with all the expertise, it would be possible to do that. But it apparently is not. There's something about the way the characters are sent from

***"I don't want to waste time
on my mainframe when
my Model III does
VisiCalc for me."***

the Commodore 8032 to the computers in the typesetting house that makes it so those computers don't understand what is being sent. The guys here don't seem to know what it is, and I sure don't."

But she uses a personal computer for word processing anyway. It's just that after she does that, a paper copy of the story goes to the typesetter where it is re-keyboarded—a colossal waste of time and money. That's too bad. (That used to happen at *Personal Computing* magazine.) Still, personal computing has helped her do her job better. No doubt about that.

Lots of people at Commodore use personal computers. Indeed, this is one of the companies where the folks are proud of the fact that there is only one typewriter in the place. "I don't know why we have it," said one. "I guess it's just so we can say we have it." What do the people at Commodore use their personal computers for? Just about what every other person who has a personal computer uses his for. They use them for word processing, for planning, for budgeting—in short, the people at Commodore and at other personal-computing companies use the computers as they would expect their customers to use them. They do more besides, but then it starts getting institutionalized.

Commodore just established a bulletin board for owners of its computers. The board is provided in cooperation with CompuServe, located in Columbus, Ohio. To use the bulletin board, a Commodore owner who gets a CompuServe subscription by buying a Commodore modem, merely calls the CompuServe number and asks for the Commodore bulletin board. Then he has access to news about the company and its products and some other helpful information. In particular, users can ask the company for help and get it the next business day. That's where Jeff Hand comes in.

Hand built the bulletin board as

part of his job at Commodore. He's the one who makes sure the bulletin board is accessed every morning to see what questions are there. Finding a question, he directs it to the appropriate person and makes sure the answer is back onto the board so the user can call and get the help he needs.

Long hours

"It took me a lot of hours—14 to 15 hours every day—just getting this thing off the ground," says Hand. "Now it's a lot easier. I've got a thousand pages on the network. Users can get answers to their questions, and so



VisiCorp's Ed Esber: Our products are productivity tools; we use them that way.

can our reps. They ask a question and get an answer the next day."

Apple Computer says it invented the personal computer, and it's probably the most celebrated of the personal-computing companies for having its employees use personal computers. But the way that all happened shows that Apple isn't into computing yet. Phil Roybal, who's the manager of communications programs ("I tell the company's story," he says.) explains how Apple got its people using personal computers.

"Two years ago, Scotty (Mike

Scott, then president) sent out a letter. In fact it was dated Feb. 1, 1980. It said that by January 1981 there would be no more typewriters in the company. It said that we believe the typewriter is obsolete, and we're going to live by what we believe. I don't really know how many people were using Apples at that time, but I suspect it was about 5 to 10 percent of the company.

"You see, there wasn't even a decent word processor for the Apple until 1979. The first one I used was called 'Doctor Memory.' It was terrible for what I wanted because it was a line editor, not a character editor. But it did the job. It was really for editing programs.

"Then Paul Lutus came along with Apple Writer and it was possible to replace typewriters with Apple computers. I was one of the first managers to move in that direction."

Roybal says the people who work for him use the Apple III now for their word processing requirements. They write everything that is said about the company. He personally uses the computer for budgeting and planning. He also uses it for electronic mail—there's an E-mail system, he says, for the entire company—database access and graphics. "I do a lot of speaking all over the country," Roybal says, "and I use the graphics for that." Apple has an incentive program called Loan/To Own. Employees who meet certain requirements can get an Apple II on loan. After a year, they own the computer.

Roybal may not be the typical user of a personal computer, working as he does with words so much. But there are others inside Apple Computer who are just like the average manager one would find in any company around the country.

Take John Butler, for example. He's the manager of national accounts—companies like General Motors, which might make volume buys of personal computers to provide them to people in the corporation.

"I can use the computer to predict the electrical demand that a building will generate."

MEANWHILE...AT PERSONAL COMPUTING

While personal computing may be a little impersonal at the companies we talked to for this story, *Personal Computing* magazine doesn't deserve any kudos for leading the new wave in computing either.

The problem at *Personal Computing* has been an institutional one all along. We need to use the computers primarily to get the material we will publish typeset. Yet we haven't enough computers to get the job done. This manuscript was written on an Apple II Plus with 64k of RAM, one disk drive, a Videx 80-column board and a soft switch to move from the Apple display to the 80-column display. But if I hadn't bought this computer myself, this story would likely have been done on a typewriter.

Presently, *Personal Computing* is trying to decide what equipment it will use to fully computerize its staff. That is, the institution is attempting to define equipment that it will, in effect, issue to all its people. Like Apple Computer, *Personal Computing* has been enjoined to get no more typewriters.

The nice thing about hardware, though, is its very versatility. Once it's in the shop, people start to use it. In fact, the few computers we have at the magazine (four: one for administrative work, two for magazine work, and one used mostly in the circulation effort) are in constant use. One of the two used for the magazine is almost always employed to write or edit stories, and the other alternates between those functions and data communications with our West Coast office. So the people at *Personal Computing* are familiar with the hardware. But there is no one who says, "my computer." When there are enough computers, and the people really are able to use them, then the computing should become personal.

Then we will have shoes, too.

Butler uses his computer to write his business plan. He has both an Apple III and a II on his desk. "The II is for electronic mail," he explains, "for sending documents over the telephone to other offices. But I primarily use my III for document creation and planning. For example, in doing this business plan I'm working on I had to do a lot of text. There are graphics also, for things like trends, discount recommendations, and so forth.

"I use Quick File as a data-base manager. I can keep the accounts by SIC (Standard Industry Classification) codes. My secretary does a lot of work with PFS. And I do financial modeling, too. When I did a point-of-purchase plan, for instance, I had to do a lot of 'what-ifs.'"

Butler says he's more fortunate than many businessmen, who don't have the time to learn personal computing. "I'm a mid-thirties manager who's figuring this out. But I'm a little farther ahead than lots of guys, because I work for Apple. They help you here. For example, when I came on board I took an Apple Writer II course. That's the last course I took. I taught myself Apple Writer III, and VisiCalc, and Quickfile. I could do that after I got the first course. I just take the computer home when there's something new to do, and figure it out and do it. It's kind of fun."

Not alone in providing help

Butler says Apple isn't alone any more in providing its people with help in learning computing. "Lots of companies are doing that," he says. "They provide what can be called information centers, with lots of different computers in them, so people who are interested in the computers can come in and learn something about them." Butler has experienced the phenomenon in his dealings with large corporations.

Yet if computing can be made easier with such management strategies, it still takes personal work. "Even

though this is the place it is," says Butler, "computing was kind of terrifying at first. We have so many computer jocks around here that it's ridiculous. They will help you, but you really have to put your own time into it. I did, and I'm glad, because I am so much more productive."

It's probably fair to say that many, if not all, of the people inside the companies in the personal-computing industry know how to use their personal computers to make them more productive on the job. But in addition to that, they also know the limitations of their machines.

They're just like cars

These folks are with their computers like people in the automotive industry are with their cars. People who work for the automobile companies buy their cars—they get them at a substantial discount, of course—to perform a specific purpose. The purpose can be one or more of several possible, but the people doing the buying get the vehicle that will accomplish the task at hand. If it's moving the family around, it's a sedan. If it's commuting to work, then often it's a small car. If the vehicle is to be used in the course of work—moving parts and material, or people, from one plant to another, for example, a purely institutional application—then the vehicle purchased will be one that can fulfill the goals of the institution. If personal use is gained from that vehicle, it's purely by accident. The tool is suited to the application.

The people in personal-computing companies use the company's products for their own productivity. But the company, sadly, often institutionalizes the computing. Then the company proudly tells the world about it. Each says it has no more typewriters. Each considers its products to be productivity tools, and then says its employees use the computers in that fashion. Some of the shoe-maker's children do. But some have no shoes.

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Audio

The Authority in Sound



The Small Business Was Under Financial Siege . . .

. . . And an accounts-receivable package put cash flow on track

by Theresa Engstrom

"We were drowning in our own bookkeeping," says Dan Rennie, until recently the owner of a San Jose art supply house called Pen and Brush. "Customers were taking 60 days or more to pay their bills. And the bank was telling us we had to do something about our cash flow or we would risk losing our credit."

Rennie's description of the way his store operated is not unique among small businesses, where an economic bunker mentality has become a fact of life for many. Too often, bills mailed out to customers sit around unnoticed and unpaid for months while the business is hounded by banks and creditors who want their loans paid on time. In Rennie's case, this situation had been building for close to eight years since the day the store opened its doors. And it came to an abrupt halt in February 1981 when Rennie bought an Apple computer and an accounts-receivable program that turned the trickle of incoming payments into a steady flow of paid invoices.

After Pen and Brush's first year of business in 1973, its annual sales were \$20,000 with few open accounts. Keeping records of invoices and payments manually was not difficult then, and Rennie, because he was the owner and sole employee,



Dan Rennie used an Apple computer system to pull his art supply house, Pen and Brush, out of a cash-flow bind.

became the chief bookkeeper. From that vantage point he watched the process of keeping the store's customer accounts current deteriorate until, by 1981, when the store was selling \$250,000 a year in art supplies, a computer seemed the only answer. In hindsight, Rennie says, the threshold for the personal-computer purchase was probably closer to \$100,000 in annual sales.

"Any business that sells \$100,000 a year and has salesmen developing outside accounts has to computerize its accounting operation if it's going to keep up with its receivables," he says. "After we bought the computer, we had an immediate improvement in

our payment pattern. We were getting our invoices out faster and usually our customers paid within 30 days. Not only were we happy, but the bank was certainly satisfied with our improved cash flow."

Order out of chaos

In most cases where the personal computer has been put to the task of bookkeeping, it has ended up at least creating order out of the chaos. Personal-computer accounting programs are among the most popular software on the market. The reason is obvious. Like spreadsheeting, the way a business handles its books is at the heart of whether the operation succeeds or not.

In general, a good accounts-receivable package will track each customer, compute the amount owed, issue monthly invoices, generate overdue notices, credit payments made to the proper accounts, and then calculate the closing balance. In general, doing all that with pen, typewriter and paper is a time-consuming and difficult chore.

While all of the basic packages on the market perform these tasks, the newer software is considerably more powerful. What is usually added is flexibility and the ability to keep more information. As an example of where accounting programs for the personal computer are heading, take the receivable program from Broderbund Software (San Rafael,

Theresa Engstrom, former editor of the New England Business Magazine, is a writer from Sharon, Mass.

Calif.), just released in August. The company claims that its package will handle 400 customers and 1700 transactions per diskette, an unusually large amount of data for software of this type to carry. In addition, the program breaks sales into 20 different categories, a feature that will gladden the hearts of inventory keepers trying to monitor the merchandise leaving the shop. And Broderbund's package also generates a report based on 14 criteria. A retailer, for instance, could ask for a list of all customers in Minneapolis who spent more than \$500 last month on automobile engine parts—and who paid their bills promptly. With that in hand, he could, as an example, develop a mailing list of preferred customers for future advertising campaigns.

Though these are unusually powerful elements for a personal-computer accounts-receivable program, many businesspeople using some of the other software packages say that with systems already in place at their firms they're not about to reorder their programs at this point. But they add that the leapfrogging of computer muscle demonstrated by Broderbund—putting most of a mini's power into a personal computer, as the advertisements claim—convinces them that their decision to turn their bookkeeping over to the personal computer was not a poor choice, and that a continuing evolution of all types of bookkeeping software is in the offing.

Too long to wait

Rennie made the decision to purchase his Apple II and an accounts-receivable program from Systems Plus (Palo Alto, Calif.) when he began to see already delivered commercial orders—a \$7000 purchase by Atari, for instance—sitting around “uninvoiced” for as long as two months.

“At that time I was writing invoices by hand,” he says, “and if there

was a dunning message necessary, I typed it onto the invoice. It's a simple fact, but when you're doing it manually you don't monitor customers as often as you would on the computer.”

So, with a friend from the Stanford University engineering school, Rennie started making the rounds of computer stores. He took a month to try out all the available accounting programs and the hardware that they run on. Because the package from Systems Plus, with its ability to easily

access a firm's general ledger of customers, has garnered a reputation for being simple to use and implement, Rennie finally settled on that product.

Software likes and dislikes

With his new system in hand, Rennie spent a couple of days learning the software—“its likes and dislikes”—and then began inputting the 70 major accounts Pen and Brush had at the time, a relatively painless chore, he remembers. “Once you under-



photos by George B. Fry III

It took Dan Rennie just a couple of days to input his 70 major accounts and begin to issue computerized invoices. Then he saw immediate improvement in his cash flow.

“With accounts-receivable packages, many small-businessmen are enjoying the view out from under the financial bunker.”

stand the software,” he says, “the mechanical part of putting data in is not so difficult. It’s just a matter of putting in names and figures at random, really. The computer puts it all in order for you.”

A psychological prod

And that, Rennie says, was all that he had to do before he came to the best part—issuing his initial batch of computerized invoices. While that was a proud moment for him, the computer-generated bills also clearly changed the attitudes of his customers toward paying on time. He describes it as a “psychological prod,” the fact that customers devote more attention to an invoice printed out on a computer than they do to a handwritten bill. This is because, Rennie says, bills issued by a computer look “more official” and imposing than a handwritten invoice.

The process of working with the Systems Plus accounts-receivable program begins when the computer calls up from the diskette memory—and brings to the screen—the general ledger, which is the list of the firm’s accounts. After that it asks the user for the number of the account that he wants to work on. After the account is accessed, the user can add any new purchase order information—such as materials bought and at what price—the discount involved, the payment terms, dunning messages and freight costs. From that information the computer calculates up-to-date billing data for the account. At this point, current invoices can be printed out. And if the account is over its credit allowance, the computer alerts the user, who can override the alert or take action with the customer.

While Systems Plus has its share of converts, there are many other accounts-receivable packages that have been as well received. And almost every user will gladly tell you his favorite reason why his program ranks among the best.

For instance, protection against

errors rates high as a feature to look for in an accounts-receivable program. To any small businessman, the thought of accidentally deleting a dollars-and-cents account, or losing a portion of his bookkeeping file, can be chilling.

Take Dr. Stephen A. Imbeau who uses the accounts-receivable program from BPI (Austin, Texas) in his office in Florence, S.C. He runs it on an Apple II Plus with 64k. And among his reasons for sticking with BPI is that it checks his tendency



Peggy Crawford had an initial bout with documentation problems, but she soon grew comfortable with computer terms.

to rush through his bookkeeping chores—and at times make errors.

Strive for accuracy

“If I’m not looking and I’m totaling too soon,” he says, “or if I’m moving figures in and out too soon (which can lead to putting the wrong numbers in the wrong categories or accounts), the computer beeps and the cursor goes back to where it should be.” No amount of rushing, he says, will defeat the program’s striving for accuracy.

Marilyn Graves, office manager of Fidelity Manufacturing in Burbank, Calif., who uses the State of the Arts

(Costa Mesa, Calif.) accounts-receivable program, by her choice of software echoes Dr. Imbeau’s belief that errors are counteracted. “If you’ve done something stupid,” she says, “it just tells you to go back and do it again. You can’t delete anything by mistake.”

With any type of program, the support that the software manufacturer provides is often crucial to the correct implementation of the package into a business. And many small-businessmen feel that when you’re dealing with a bookkeeping package—the financial lifeline of a company—the word crucial cannot be emphasized enough. Support, or the willingness of the software house to be on call while a user is adjusting to the new program, can, for a business, be like having a consultant move in for a few months while the accounts-receivable program is being set up.

Dialing the support line

Most accounts-receivable software houses answer the call for help quite well. For instance, many have toll-free phone lines for quick assistance. And Mark Freer, owner of Hydrosphere, an Anaheim, Calif. plastics industry supplier, relates that the software house he deals with, Continental Software (Culver City, Calif.), has always been willing to go the extra support mile with him—and they have also been patient as he has learned the needs of his business.

“I can’t believe how much help they’re willing to give me,” he says. “I must have traded in software with them 10 times since I became their customer. Most of the time, though, I just call them and they correct the problem right over the phone. The last time it took them only two minutes.”

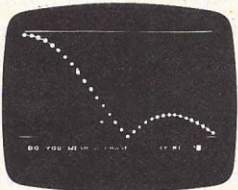
The major complaint that accounts-receivable program users have is that the documentation can be too complicated and not explicit enough for small-businessmen who

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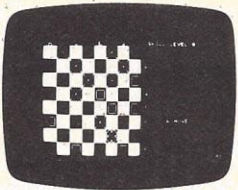
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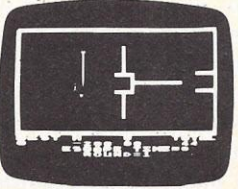
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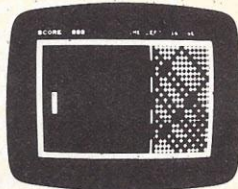
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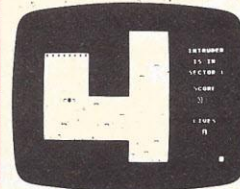
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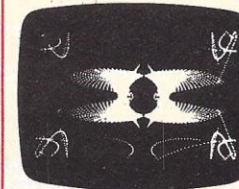
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BUSINESS


may be taking their first shot at computerized bookkeeping.

Peggy Crawford, vice president of Executive Design, a sign-making firm in North Hollywood, Calif., uses the accounts-receivable program from Continental—and has learned to love it—but she remembers the bad old days when she first bought the program and wondered if her purchase was a mistake. The complex documentation heated her fears.

"I love it now," says Crawford, "because I hated sitting down for eight hours writing out invoices and sales reports. I couldn't go back to doing the books manually. But it took me about six months to get comfortable enough with the program to say this. I had a lot of trouble understanding the manual. Because I'm used to doing the books by hand, I didn't understand the terms that the software manual was using."

A minor grievance

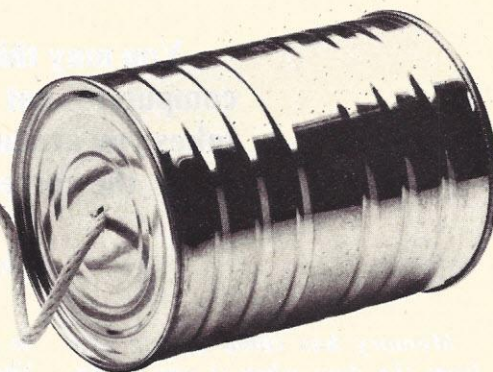
This is perhaps a minor grievance, especially to most users who finally get their programs up and running and become satisfied with the direction their bookkeeping has taken. But Dan Rennie heard documentation complaints from his peers so many times that he seized the opportunity to profit from this problem. He sold his art supply store to his partner earlier this year and went into the consulting business where he will attempt to clear up the confusion that some small businesses and professionals go through as they transfer their bookkeeping from a manual system onto a computer.

The obstacles, though, are minimal, and well worth the effort to overcome them, most users say. Still, throwing away the manual bookkeeping system that served so faithfully—but perhaps not so well—does take some nerve and lots of faith. But switching to a computerized billing operation has many small-businessmen enjoying the view out from under the financial bunker. 



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More Computer Muscle To Power The Machine

You may think you need more memory in your computer—but beware of pitfalls. This special report takes you around the landmines and down the road to the correct use of extra computer power

by Lee Thé, Associate Editor

Memory has come a long way from the days when it was bulky, costly and very power hungry. New memory-device designs promise to put more memory into smaller spaces, which will translate into more memory for the consumer dollar.

Memory technology—like computing technology in general—doesn't stand still for long. The only sure thing about memory is that you never have enough. As you begin to explore the capabilities of your computer, you'll find that it will be able to do so much more with just a little bit more memory. And on it goes.

Welcome to the horsepower race of the '80s—the contest among computer makers to tout progressively bigger memories, faster central processing units, more massive mass storage. Like the automobile horsepower race of the '60s, added computing muscle can translate into useful results. Unlike automobiles, you can add cylinders under a computer's hood. As with the automobile, there are questions—practical questions.

Can you actually use all this muscle? Just what is memory? How can it be added? What could that do for you? What pitfalls are there? What's available now, for how much, on what machines? Is it easier to add memory

to some computers than to others? Should you do it yourself? Can your present software handle more memory? How much memory do you need? How much might you need later?

Never enough memory

Quantitatively speaking, you will never really have enough computer memory. Think of it this way. How much memory would you like your brain to have? Wouldn't you like to be able to remember every skill you ever learned, every person you ever met, every useful fact that ever brushed by you? Could you imagine ever saying to yourself, "I have enough memory. I don't need any more"? Of course not.

Personal computing, in a very real sense, is a direct extension of your mind and the data you command. When you talk about how much memory you want your computer to have you're talking about how much memory you want yourself to have. You're talking about how quickly, how thoroughly and how easily you want your computer to help you in your drive toward your life's goals.

The reality of mass storage

From that perspective you'll want every byte of RAM you can cram into your machine, just as you'll also want as much mass storage as you can

have. As you empower your machine you empower yourself. You increase your effective IQ. Would you like that? Of course. With that in mind let's take a look at the reality under the computer's hood.

What were the deductions on your 1981 tax return? When is your wedding anniversary? How do you extract a square root?

The tax numbers are probably not in your mind's active memory, but you're likely to have a marker there to lead you to a file. That file is your mass storage—where you put masses of information that would otherwise clog your active consciousness. The wedding anniversary date resides in your active memory—well, it better reside there—part of an immense number of facts you can access (get at) at random, immediately, like your social security number, or recent events like what you had for lunch today. That's your Random Access Memory (RAM). Extracting the square root calls up a process—a learned set of instructions. That process also resides in your RAM. You probably put it there through exposure to a course (program) in math.

Your memory varies both in character (skills, recollections, operating space) and in strength. Thus you may have sharp driving skills, fair French,

(continued on page 93)

MEMORY BUYERS' GUIDE

Literally hundreds of firms could appear on this chart. Those listed here are the better-known ones. Many of these added memory devices come with associated software and hardware that increase their utility for various tasks, so two firms making 16k RAM cards for an Apple may, in fact, be offering two very different products. And many offer ROM chips in conjunction with their RAM products. You should also be aware that most computer manufacturers sell additional memory for their own machines.

Advanced Logic Systems
1195 East Arques Ave.
Sunnyvale, CA 94086
(408) 730-0306
Apple: 16k card—available bundled with 80-column card and CP/M card
CIRCLE 450

Anfex Data Systems
2630 California St.
Mountain View, CA 94040
(415) 941-7914
IBM Personal Computer: 64-256k
CIRCLE 257

Apparat, Inc.
4401 So. Tamarac Pkwy.
Denver, CO 80237
(303) 741-1778
Apple II Plus, Radio Shack TRS-80 Models I & II, IBM Personal Computer: chips for motherboard; Commodore VIC-20: 8k RAM cartridge
CIRCLE 453

ASAP Computer Products, Inc.
1198 E. Willow St.
Signal Hill, CA 90806
(714) 891-2663
IBM: cards 64-256k; Atari: cards 16 or 32k; S-100-type computers: cards (16-64k)
CIRCLE 454

AST Research, Inc.
2691 Richter Ave.
Irvine, CA 92714
(714) 540-1333
IBM Personal Computer: 64-256k
CIRCLE 253

Axlon, Inc.
170 N. Wolfe Rd.
Sunnyvale, CA 94086
(408) 730-0216
Atari 400 & 800: 32k Memory Module; Atari 800: 128k disk emulator (also usable as bank-selected RAM); Atari 400: 48k Memory Module; Apple II & II Plus: 320k 2-drive disk emulator with battery backup
CIRCLE 455

California Computer Systems
250 Caribbean Dr.
Sunnyvale, CA 94086
(408) 734-5811
64k boards for CCS and other S-100 computers
CIRCLE 456

Chrislin Industries
31352 Via Colinas
Westlake Village, CA 91362
(213) 991-2254
IBM Personal Computer, S-100, multibus systems, 64-512k
CIRCLE 260

CompuPro Division Godbout Electronics
P.O. Box 2355
Oakland Airport, CA 94614
(415) 562-0636
8-128k boards for CompuPro and other S-100 computers
CIRCLE 457

Cromemco
280 Bernardo Ave.
Mountain View, CA 94043
(415) 964-7400
64-512k boards for Cromemco and other S-100 computers
CIRCLE 459

Davong Systems, Inc.
1061 Terra Bella Ave.
Mountain View, CA 94043
(415) 965-7725
Apple II: 16k cards; IBM Personal Computer, 64-256k cards
CIRCLE 460

Hurricane Labs
5149 Moorpark Ave.
San Jose, CA 95129
(408) 257-8676
Radio Shack: 64k card with additional functions
CIRCLE 464

Intercontinental Micro Systems Corp.
1733 S. Douglass Rd.
Anaheim, CA 92806
(714) 978-9758
S-100: 256k card
CIRCLE 451

Intermedia Systems
10601 South De Anza Blvd.
Cupertino, CA 95014
(408) 996-0900
IBM Personal Computer: 192-512k
CIRCLE 465

Legend Industries Ltd.
2220 Scott Lake Rd.
Pontiac, MI 48054
(313) 674-0953
Apple II: 64-128k cards
CIRCLE 466

Lomas Data Products
729 Farm Rd.
Marlboro, MA 01752
(617) 481-2822
S-100: 128k static, 128-256k dynamic
CIRCLE 255

Macrolink Inc.
1150 E. Stanford Ct.
Anaheim, CA 92805
(714) 634-8080
IBM Personal Computer: 64-256k cards
CIRCLE 467

Macrotech International Corp.
22133 Cohasset St.
Canoga Park, CA 91303
(213) 887-5737
any S-100 based system: 256k card
CIRCLE 251

Magnolia Microsystems
2264 15th Ave. W.
Seattle, WA 98119
(206) 285-7266
Heath/Zenith 89.90: 128k RAM board/disk emulator
CIRCLE 468

Memory Merchant
14666 Doolittle Dr.
San Leandro, CA 94577
(415) 483-1088
S-100: 64k
CIRCLE 254

Memory Technologies, Inc.
25 Main St.
Twelve Mile, IN 46988
(219) 664-5741
IBM Personal Computer: 64-512k and memory-expansion chips
CIRCLE 469

Memotech
7550 West Yale Ave., Suite 200
Denver, CO 80227
(303) 986-1516
Timex-Sinclair 1000, Sinclair ZX81: 16-64k total RAM via modules
CIRCLE 470

Micro Intercontinental Systems Corp.
1733 South Douglass Rd., Suite E
Anaheim, CA 92806
(714) 978-9758
S-100: 256k card
CIRCLE 471

Microsoft Consumer Products
10700 Northrup Way
Bellevue, WA 98004
(206) 828-8080
Apple II: 16k card; IBM: 64-256k cards
CIRCLE 473

Mosaic Electronics
P.O. Box 748
Oregon City, OR 97045
(503) 655-9574
Atari 400 and 800: 32k card
CIRCLE 475

Mountain Computer
300 El Pueblo Rd.
Scotts Valley, CA 95066
(408) 438-6650
Apple II: 16-32k RAM cards
CIRCLE 476

MPC Peripherals Corp.
9424 Chesapeake Dr.
San Diego, CA 92123
(714) 278-0630
Apple II: 128k disk emulator card using bubble memory
CIRCLE 477

MTI (Microcomputer Technology, Inc.)
3304 W. MacArthur
Santa Ana, CA 92704
(714) 979-9923
Apple II, Radio Shack TRS-80 Models I & II, S-100 computers: RAM chips; MTI CX: highly modified TRS-80 Model III with 16k extra RAM
CIRCLE 478

Personal Computer Products, Inc.
16776 Bernardo Center Dr.
San Diego, CA 92128
(714) 485-8411
Apple II, III: 64k plus alternate processor, clock, other functions
CIRCLE 481

Persyst
22957 La Cadena
Laguna Hills, CA 92653
(714) 859-8871
IBM Personal Computer: 64-256k
CIRCLE 261

Precision Technology Inc.
Computer Products Division
2970 Richards St.
Salt Lake City, UT 84115
(801) 487-6266
VIC 20 card
CIRCLE 483

Quadram Corp.
4357 Park Dr.
Norcross, GA 30093
(404) 923-6666
8-64k print spooler for Epson and similar printers, most computers; IBM Personal Computer: Quad Board with 64-256k + clock, parallel, serial ports
CIRCLE 484

Quantum Data, Inc.
3001 Redhill Bldg. 4, Suite 105
Costa Mesa, CA 92626
(714) 966-6553
Commodore VIC, 16 and 24k cards
CIRCLE 486

Renaissance Technology Corp.
1070 A Shary Circle
Concord, CA 94518
(415) 676-5757
NEC PC-8000: 32k RAM card
CIRCLE 487

Saturn Systems
P.O. Box 8050
Ann Arbor, MI 48107
(313) 973-8422
Apple II: 32-128k RAM cards
CIRCLE 488

Seattle Computer
1114 Industry Dr.
Seattle, WA 98188
(800) 426-8936
IBM: 64-256k RAM cards; Seattle and other S-100 computers: 4-64k RAM cards; some with additional functions
CIRCLE 490

Sigma Designs, Inc.
3866 Eastwood Circle
Santa Clara, CA 95055
(408) 496-0536
IBM Personal Computer: 64-256k cards and memory-expansion chip
CIRCLE 492

SSM Microcomputer Products, Inc.
2190 Paragon Dr.
San Jose, CA 95131
(408) 946-7400
S-100 computers: 32-64k RAM cards
CIRCLE 493

Static Memory Systems
401 State Bank Center
Freeport, IL 61032
(815) 235-8713
S-100: 32-64k
CIRCLE 258

Systems Group
1601 W. Orangewood Ave.
Orange, CA 92660
(714) 633-4460
S-100: 64-128k
CIRCLE 252

Tara Computer Products
3648 Southwestern Blvd.
Orchard Park, NY 14127
(716) 662-7219
Atari 400: 16-48k cards; Apple II: 16-128k
CIRCLE 496

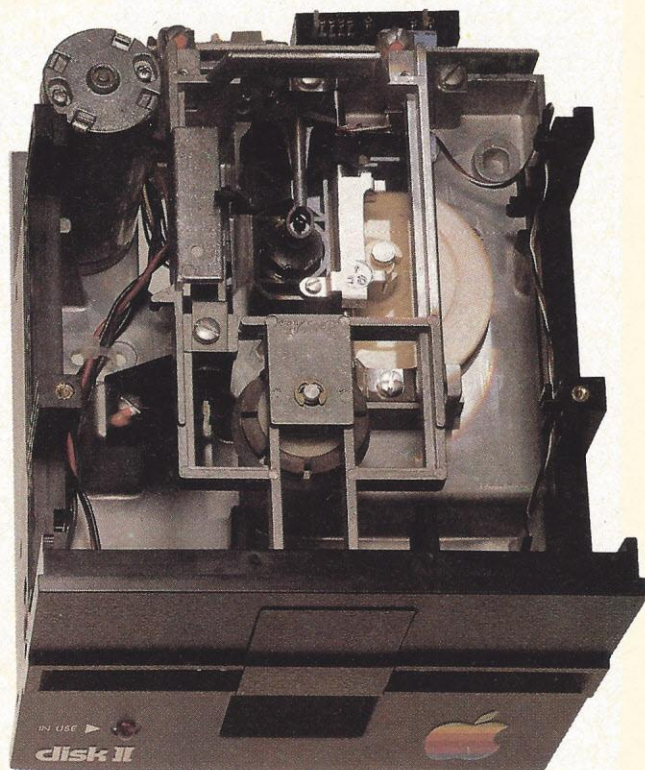
Tarbell Electronics
950 Doylen Pl., Suite B
Carson, CA 90746
(213) 538-4251
64-128k RAM cards for Tarbell and other S-100 computers
CIRCLE 497

TecMar
23600 Mercantile Rd.
Cleveland, OH 44122
(216) 464-7410
IBM Personal Computer and S-100: 64-256k RAM cards
CIRCLE 498

Vista Computer Co., Inc.
1317 E. Edinger Ave.
Santa Ana, CA 92705
(714) 953-0523
IBM Personal Computer: 256-576k
CIRCLE 499

VR Data
777 Henderson Blvd., N-6
Folcroft, PA 19032
(800) 345-8102
IBM Personal Computer: 64-192k RAM cards
CIRCLE 500

When you say your disk drive has more juice than Apple's, be prepared to cut one open.



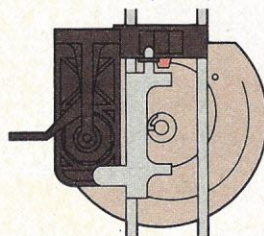
The problem with Apple's disk drive stems from the core.

There are a lot of good reasons why dealers all over America aren't recommending Apple's disk drive. And one of the main reasons is Rana Systems' new Elite Series of Apple II compatible disk drives.

It's easy to see why Apple® has been having some major slipped disk problems. Just look at their antiquated head positioner.

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It's plastic. Just like a toy. That's why it can take multiple passes to get the information needed. And why the information on your disk can appear obscured and unreadable. If Apple's positioner doesn't accurately center the head over your data tracks, it's no bargain at any price.



Apple's primitive plastic positioner. A workable, but sloppy, way to capture data.

Rana knows the head positioner is the heart of the machine, so we didn't cut any corners. To most accurately place the head over the data area we use finely machined lead screws and metal band positioners. They provide you with the fastest and clearest data recognition on the market. With three to four times faster access, track to track. With far greater precision than Apple's, to give you virtually 100% data integrity.

Rana's state of the art technology lead screw and metal band positioners give vastly improved speed and accuracy.

More juice on Apple's inferiority.

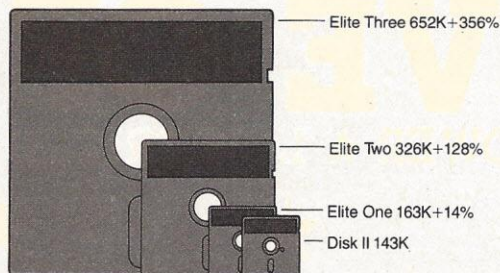
There's another big problem Apple has chosen to ignore. The irritating scratching noise that occurs when it is searching for information. Rana, on the other hand, has built the Elite Series to be virtually noiseless.

And more importantly, Rana has an advanced write protect feature which makes it impossible to lose your information. A simple touch on the front panel's membrane switch gives you failsafe control. Apple of course only has a notch or tab, which gives you only minimal protection.

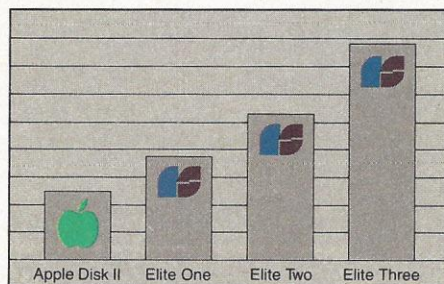
With the superior Elite controller card, you can control up to four floppy disks using only one slot. With Apple's you can only use two. Of course, you can still plug into Apple's controller card, but down the line you'll want to switch to Rana's and save yourself a slot.

Elite also gives you more byte per buck.

Even our most economical model, the Elite One, gives you 14% more storage than Apple's. 163K versus Apple's 143K. With our Elite Two offering 326K and our top-of-the-line Elite Three offering a 356% storage increase at 652K. That's almost comparable to hard disk performance, all because of our high density single and double sided disks and heads.



And the cost? Just look at the chart. 272 Bytes per dollar for Apple, versus between 363 to 767 Bytes per dollar for ours. They're not even close.



The real beauty of it isn't the beauty of it.

There is no comparison to the lean, clean design of the Elite Series to Apple's 5 year old model (which by the way has never been updated). It's our superior technology, operating economy, increased storage and faster step that makes us the best performing and hottest selling disk drive in America.

So give us a call or write for more information. It doesn't take a lot of courage to cut into an Apple when you outshine them as brilliantly as we do.

RanaSystems



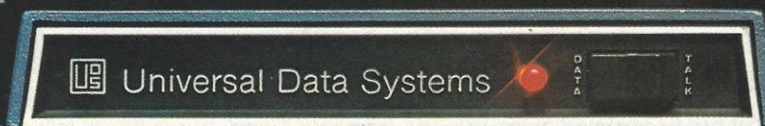
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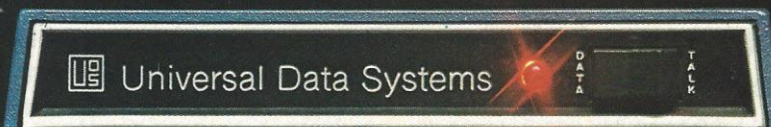


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originate/answer
1200 bps



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(quantity one)

202S LP
auto-answer
1200 bps



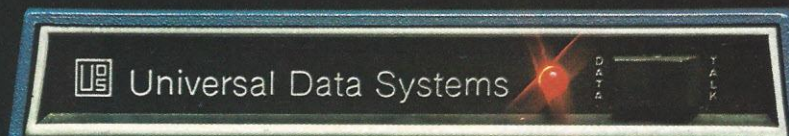
\$295
(quantity one)

202 LP
1200 bps



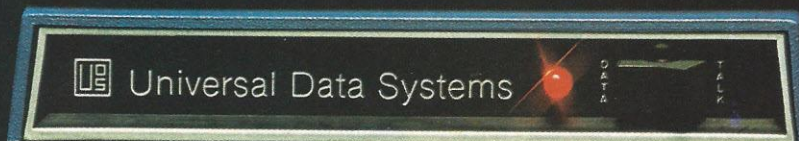
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(quantity one)

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originate/answer
auto-answer
300 bps



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(quantity one)

103 LP
originate/answer
300 bps



\$195
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SPECIAL REPORT

MORE COMPUTER MUSCLE

(continued from page 88)

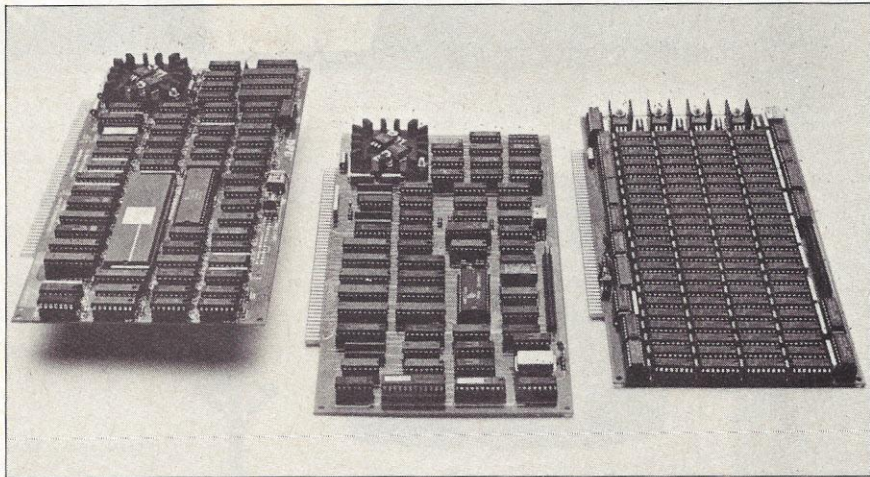
rusty trigonometry, and a faded recollection of facts picked up in the third grade about Indians who once lived where you live now.

Computer memory shades from one sort to another sort in much the same way as mind memory. RAM is ready memory and disk drives are storage memory. You might have archival storage on tape cartridge, such as what Corvus offers for its hard disk drives as backup. Hard disks are just that—hard. They spin faster than floppy disks, hold more data and can get at it faster, though still slower than RAM. They cost upwards of \$2000.

The human relationship

We humans and our computer creations can both be seen as having operating systems, programs and data space. All three are stored in mass storage and used in RAM—the active memory. Programs and operating systems can be stored in read-only-memory (ROM) also, including computer languages. Apple's Applesoft version of BASIC resides in ROM, for instance. Makers generally put into ROM what they don't think they're going to change or revise. That saves RAM for programs and data at the expense of flexibility. RAM can be changed at will; that's what it's for. ROM can be changed, too, by exchanging chips or in some cases burning a new memory into chips. RAM is what the makers are selling as computer horsepower. Let's look at how memory capability (that is, RAM) is placed into a computer.

At the lowest level, computer memory only sees things in black and white—on/off, yes/no, zero/one, however you want to look at it. That singular decision constitutes a "bit." It takes eight bits or so to define one symbol, like a letter or a number. Because memory, to be meaningful, has to be seen in terms of how many characters it contains, it is usually mea-



The dual-processor unit (left) from Cromemco (Mountain View, Calif.) runs the memory-control unit (center) which manages the memory-storage unit at right.

sured and described in bytes. This is also useful since the number of bits any given machine needs to define a character may vary somewhat. Some advanced computers need more bits per character because they do something called parity checking, which adds a double-checking bit to the bits in the byte to make sure it's the right byte. Bytes are measured in thousands (k) and millions (M—megabytes—megs).

Bytes reside in chips, disks, tapes, punched cards, paper tape. They also reside in exotica like videodisks and bubble memories. RAM-type bytes live only in chips. Chips (grown out of silicon and trace chemicals) are where the work is done. Without chips there would be no computing as we know it. You can't see the chips. They are housed in small, slim plastic, metal or ceramic packages with dozens of centipede feet extending down each side.

A computer's processor (central "brain") and much more are all on chips, packaged and mounted on green printed circuit (PC) boards that connect them all together via wires printed on the board. The main board is called the motherboard. Expansion cards containing things like extra RAM are inserted into slots on the motherboard or into other slots on or in the machine.

You can usually tell where the RAM is in a computer because you see rows of identical chip packages. Many computers can be bought with less than the full complement of RAM chips on the motherboard, so the first step of RAM expansion with these is filling in the sockets before

going on to RAM-laden expansion cards. RAM cards can also have empty sockets to provide stages of expansion.

Expanded memory lets you tackle bigger jobs. It can speed up your computing, make it easier to do, more convenient. It can add capabilities you formerly lacked and let you run large programs that combine the functions of several conventional programs.

Added memory can give you a luxurious, arms-spread-out kind of feeling. Working with larger tracts of data is surely the most obvious benefit of added RAM, especially when you need all your data in your RAM at once. In most spreadsheet programs, you want to see how a change in one factor can affect up to hundreds of others. Other things being equal, if you have to keep swapping data in and out of mass storage to alter a big model you could grow a beard waiting to see the results. That's why VisiCalc works entirely in RAM.

People using computers for professional applications tend to run out of room with their models as they get excited using them and as they factor in more and more facts and variables. Many people don't realize that just a little more memory can greatly expand the data space of RAM. That's because no matter what size the memory is, you need a certain amount, for the operating system and the application program's code. Everything above that is gravy.

For instance, a personal computer with 48k RAM (still a common
(continued on page 96)

ADDING AND POSTING ENTRIES

ADD JOURNAL ENTRIES
ENTRY NUMBER XX

1. JOURNAL NUMBER GL
 2. DATE
 3. DESCRIPTION
 4. ACCOUNT NUMBER
DEBIT CREDIT
 5. AMOUNT
- IS THIS ENTRY CORRECT? Y

On the Add Journal Entries screen you will be prompted to supply the journal number (1000). This number identifies transactions as belonging to a subgroup within the batch. For example, all figures concerning the payroll checks issued in a particular payroll may be in one particular journal, and the batch number may consist of all payroll expenses. The number you enter will be the default journal number for subsequent entries, until you change it.

For the first entry in a batch, the default date will be the batch date. The default date for succeeding entries will be the same as the previous entry's date.

When entering Debits or Credits on the Add Entries screen, remember that you must provide offsetting entries to keep the debits in balance with the credits. Credits are entered by first pressing RETURN, raising the cursor to move to the CREDIT column, and then entering the amount. If you have made a mistake in entering a debit or a credit, and have already pressed RETURN, simply press N to DELETE ENTRY CORRECT? To change the amount, press the selection number for amount, position the cursor to either the debit or credit column (remember that RETURN will move it to the credit column), then type a zero, and press RETURN again. This will automatically clear any amount you've entered, allowing you to type in a different amount. When you have finished making your entries you will press END to return to the Journal Entry Menu.

Selection 5 allows you to post your entries. Post Entries is the process whereby you make your journal entries permanent. Once entries have gone through the Post Entries process, they cannot be changed except through adjusting journal entries.

01194-1

CAPITAL, FARMSET, EQUIPMENT
GENERAL JOURNAL LEDGER
BATCH DATE 04/30/82

DATE 04/15/82
PAGE 1

ENTRY NUMBER	ACCOUNT NUMBER	JRNL NUMBER	JRNL DATE	DESCRIPTION	DEBITS	CREDITS
1	10000	01004	04/15/82	COMMISSIONS FOR 4-15	2,344.75	
2	23000	01004	04/30/82	COMMISSIONS 4/15		2,344.75
JOURNAL TOTALS					2,344.75	2,344.75
3	70000	01007	04/30/82	SALARIES 4-15	42,000.00	
4	70000	01007	04/30/82	SALARIES 4-15	18,118.00	
5	70000	01007	04/30/82	PAYROLL 4-15	800.00	
6	70000	01007	04/30/82	PAYROLL 4-15	1,712.43	
7	23000	01007	04/30/82	PAYROLL 4-15		1,712.43
8	10100	01007	04/30/82	PAYROLL 4-15		10,400.00
JOURNAL TOTALS					62,630.43	62,630.43

F BATCH TOTALS

GENERAL JOURNAL REPORT

This report shows all imported entries that have been made to the General Ledger. You will see print this report for Transfer Entries and in a slightly different form, for Standard Entries. Please consult the Chart of Accounts report key for standard items not explained here.

- A BATCH DATE 06/15/82 — Date entered at the start of the Journal Entries program.
- B JRNL NUMBER — This is entered during Journal Entries, representing a group of similar entries.
- C DEBITS — The dollar amount of the entry, if entered as a debit.
- D CREDITS — The dollar amount of the entry, if entered as a credit.
- E JOURNAL TOTALS — The total of all debits and credits for this journal. All debits should equal all credits.
- F BATCH TOTALS — The total debits and credits for the batch. Total debits must equal the total credits for the batch.

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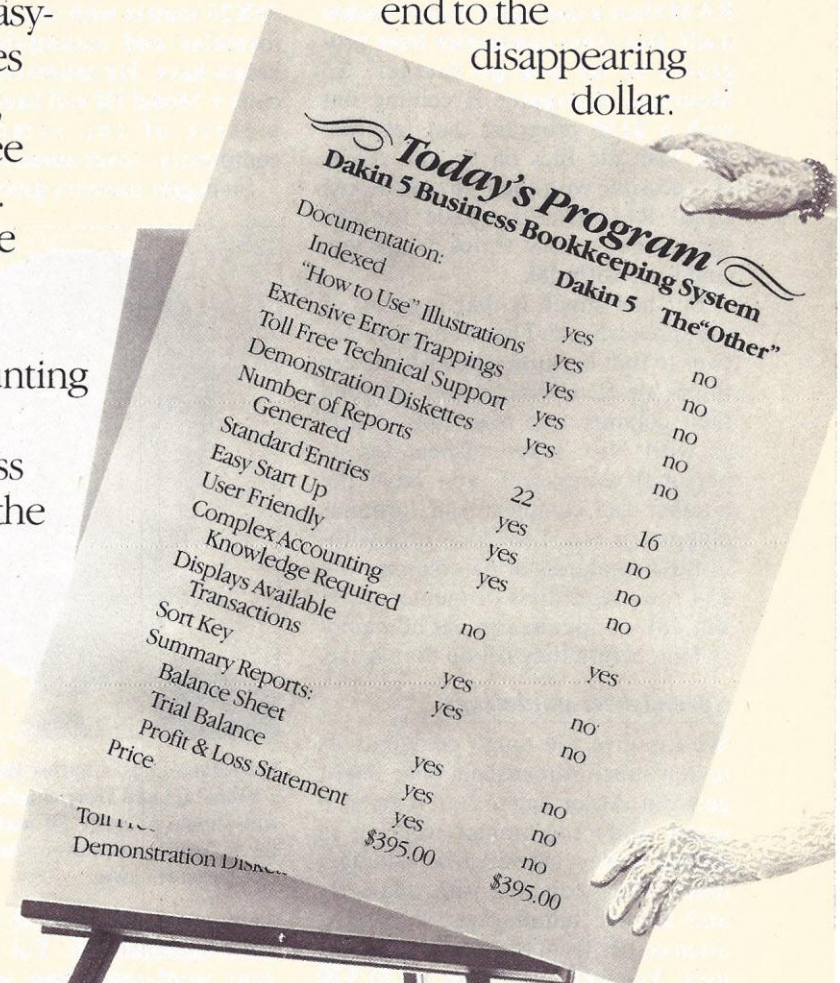
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"How to Use" Illustrations	yes		no
Extensive Error Trappings	yes		no
Toll Free Technical Support	yes		no
Demonstration Diskettes	yes		no
Number of Reports Generated	yes		no
Standard Entries	22		no
Easy Start Up	yes		16
User Friendly	yes		no
Complex Accounting	yes		no
Knowledge Required	yes		no
Displays Available	no		yes
Transactions	yes		no
Sort Key	yes		no
Summary Reports:	yes		no
Balance Sheet	yes		no
Trial Balance	yes		no
Profit & Loss Statement	yes		no
Price	\$395.00		\$395.00
Toll free Demonstration Diskettes	yes		no

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"You will want every byte of RAM you can cram into your machine. As you empower your machine, you empower yourself."

MORE COMPUTER MUSCLE

(continued from page 93)

amount) will have about 18k of space available for the VisiCalc spreadsheet. The rest is taken up with the computer's operating system (OS) and the VisiCalc program itself. Add 16k of RAM to that—say, with a RAM card—and the data space is increased to 34k. VisiCorp doesn't make versions of VisiCalc for more RAM than a computer maker makes itself. But other companies have programs to let you go further. So Mountain Computer is coming out with a \$150 program that lets you run VisiCalc files on an 80k Apple II—possible with their 16/32k RAM card. Result: 50k space for the spreadsheet—2.8 times what you could get with 48k.

But how much is that in terms of the spreadsheet? There's no easy answer to that because spreadsheets are three- or four-dimensional. Beyond their columns and rows (and depth, as with NEC's spreadsheet for its personal computer), you have the number and complexity of formulas plugged in, too. VisiCalc works within the boundaries of 63 columns and 254 rows regardless of memory size. But 48k computers run out of memory long before they fill up that space.

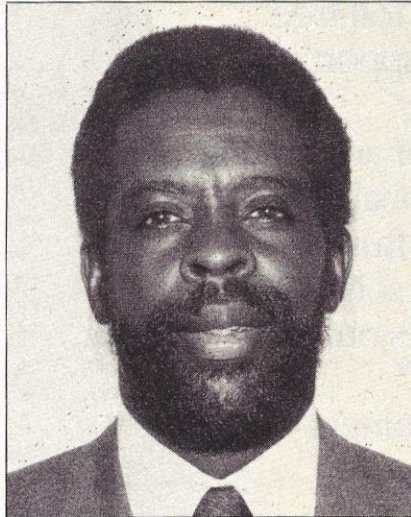
Spreadsheet guidelines

We can give you rough guidelines as to how much spreadsheet your RAM gets you. According to Jeff Walden, a writer and programmer working in Silicon Valley, his own annual budget takes 18-24 columns with quarterly and annual summations. The variation comes from the size of labels he uses. Vertically he'll use up to 130 rows. This takes up about 18k on his 64k personal computer. So even a home budget would tax the capacities of the average extant machine. Imagine what a business would need.

The same thing can be done with other spreadsheet programs (such as Sorcim's Supercalc) running on other personal computers (such as the Ra-

dio Shack Model III). Hurricane Labs of San Jose, Calif., makes a combination 64k RAM and processor card for the Model III, giving it a total 112k when you figure in the 48k a fully configured Model III carries. Charles Dixon, Hurricane's marketing manager, says they have tested a 48k version of the computer running CP/M and Sorcim SuperCalc. He reports it being able to handle a 26X26 matrix with the sort of mix of formulas and assumptions spreadsheets have. He estimates the Hurricane+ Model III will handle a 70X70 matrix of the same level of complexity—over seven times larger.

So bigger memory gives you bigger



Hurricane Labs' Charles Dixon says that a Model III and Hurricane's add-in board will handle a 70 by 70 matrix. That's a seven-fold increase over what a Model III can do on its own.

space. And it helps with things other than spreadsheets. For instance, if your word-processing software can use the larger space you can edit swiftly without having to wait for the computer to sniff around on your disk drive for what you need. This introduces the second benefit—time.

Many word processors are disk-oriented rather than RAM-oriented. They treat the whole disk as if it were in the RAM, and the software does

its work by swapping data on and off disk. Each instance of the computer going to the disk takes time. If larger chunks can be swapped into the RAM, time will be saved.

Saving time by swapping larger chunks is called track buffering; the computer actually gets much more into the RAM than the program needed at the moment, playing the odds that the next thing needed will be adjacent to the previous data. While that doesn't always happen, it happens often enough to speed processing appreciably.

Track buffering needs RAM to spare, in order to work. It speeds processing by cutting down on I/O needs. And reducing I/O will often increase net computing speed (throughput) more than would speeding up the processing itself. That's because most business applications don't put much demand on the computational abilities of the Central Processing Unit (CPU). Mostly you're getting stuff from mass storage, doing some very simple (mathematically speaking) operations on it and sending it back out to mass storage again. We call such computing "I/O-bound," because the performance bottleneck lies in how long it takes you to run the moving parts in disk drives and related activities.

Processor-bound computing

Scientific/engineering computing is often "processor-bound" because there the processor's ability to cogitate is stressed by complex mathematical operations. Here a speedy, powerful processor helps a lot. Speed is determined by how many millions of cycles a second (MHz, or Mega-Hertz) the processor's "clock" runs at. Power is determined mainly by the size of the processor's internal registers (a form of memory inside the processor it can use even faster than a computer's RAM). That's where you get references to 8-bit and 16-bit computers—16-bit computers have more power, basically, because they

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“At the lowest level, computer memory only sees things in black or white—on or off, yes or no, zero or one.”

can handle more data per cycle. So an “8 MHz, 16-bit computer” is hot stuff—but a big RAM may be more important for you.

The distinction between I/O-intensive and processor-intensive computing helps you analyze performance comparisons between computers. You may read a “benchmark test” comparing throughputs by running the same program on different machines and timing them. But for it to be really useful to you, the benchmark program must be as I/O- or processor-intensive as your computing normally is.

So don’t get caught in the wrong horsepower race. For most professional uses a large RAM and a hard disk drive are the two things that will speed up actual throughput the most. They reduce I/O time and speed up such I/O as you need. And of the two of them, added RAM generally costs a lot less. So it’s the natural place to start.

RAM can be software-configured to act like a solid-state disk drive that is many times faster than any real disk drive. This is called disk emulation. Just to keep things confusing, Axlon makes a disk drive emulator for the Apple that looks like an Apple disk drive, has the storage capacity of more than two electromechanical drives, and costs about what two drives cost. You still need a conventional drive to load programs and make backup/storage disks—but for I/O-heavy tasks this can be a godsend. If you’re using a computer now, think of all the finger-tapping time you put in staring at the little red light on your drive while it chatters to itself. What’s that total time of yours worth?

Disk emulation won’t load copy-protected software, so if your task keeps going to and from a copy-protected program disk a lot, you won’t save time. But if you keep going to and from a data disk a lot—or are doing things like compiling—disk emulation could pay for itself very

quickly. And a variety of RAM cards can be configured as disk emulators. Even smaller ones with 16k on them could do the job, depending on the size of the files you’re working with.

The large living space added memory can confer—along with the faster throughput reduced I/O can give—add up to making personal computing more convenient. But extra horsepower can also give you the equivalents of air conditioning, power steering, cruise control—not just the convenience of being able to haul more, faster. In a nutshell, more memory gives programmers room to build in helpful features, helpful to both the operating system and to application programs.

You can do the same using a lot of disk space and overlays. Overlaying software consists of creating an applications program too big to fit into your RAM and having the program go and get what it needs in order to execute your command. For instance, when you want to do a word count on text you’ve written in Hayden’s Pie Writer (for the Apple), you see the disk drive whirr about four seconds while the program goes and gets the code it needs to execute the command. It doesn’t hold that code in RAM, though. If you write five words more and do another word count, it still has to get that function off the disk.

More convenience features

Software overlaying is a good way to provide convenience features—like being able to get a word count—with limited RAM. But it’s even more convenient to get that feature without having to wait for the program to get the feature off the disk, at four seconds a pop.

Convenience features divide into those that help you learn (or relearn) how to use your system and its software, those that give you additional information, those that give you assistance if you need it, those that cut down on the amount of effort (often

measured in keystrokes) needed to get any particular task done, and those that increase your ability to control communications between you and the system.

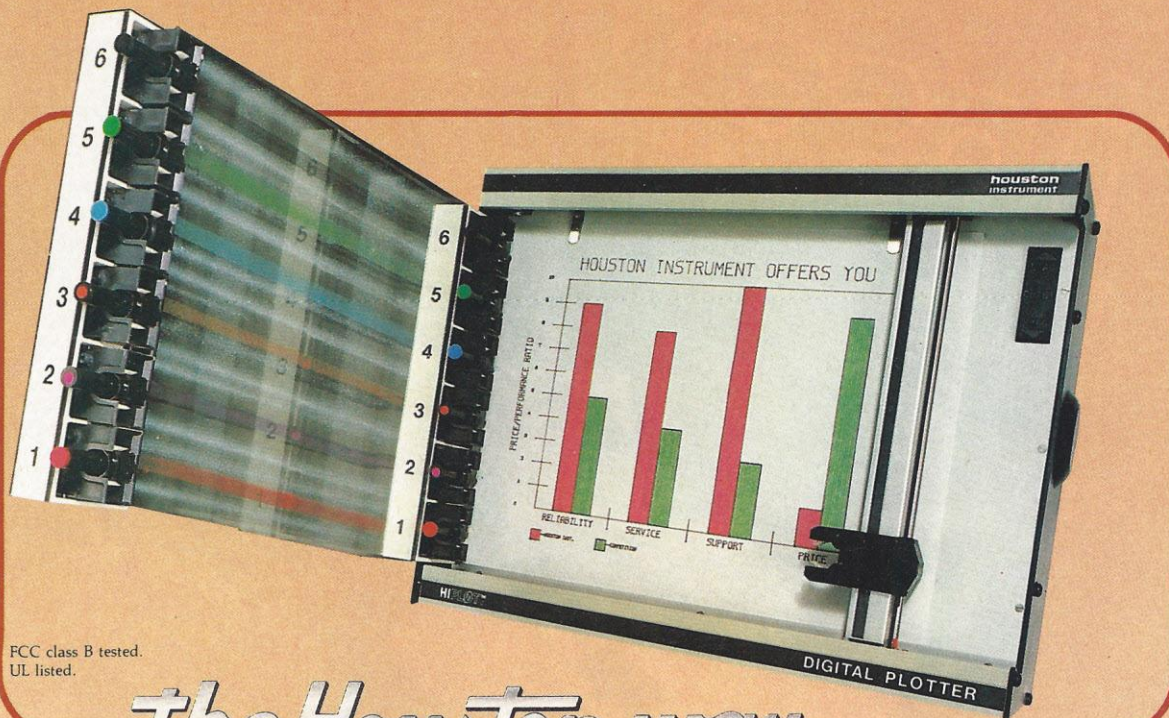
Thus, a large-memory, convenience-rich program would have both an introductory and a brush-up tutorial that would help you get started using the software and help you quickly relearn how to use it in case you had been away from it for a while and felt a bit rusty. It would also have shortcuts everywhere, so you could go straight to the instruction needed without having to grind through one all-purpose robotized teaching session. If the original tutorial would take 90 minutes to go through, the brush-up might take 10. Select Information Systems’ word-processing program (Kentfield, Calif.) does this with overlays. But if enough CP/M users elect to go to 128k and an extended CP/M system, then software houses like Select are likely to do a high-memory version.

Map a richer territory

Additional information gives you a richer map of the territory. For everything you use computers for, you can probably come up with a variety of “instrument readouts” you’d love to have, either on-screen or able to be called up at will. To continue our word-processing example, that would include word, line and character counts; status of the file(s) on disk, including a running “gas gauge” of space used up/remaining; a translation of the word count into how many pages would be if printed out in that the type size, letterspacing and overall format you’d keyed in—in general, anything in any kind of program that helps you preview how it will look and work in its final, out-in-the-world form.

One additional information form being used by some makers displays function key labels dynamically across the bottom of the screen. This beats paper strips laid on the key-

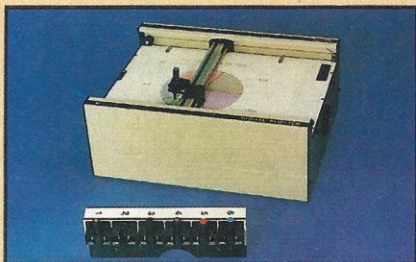
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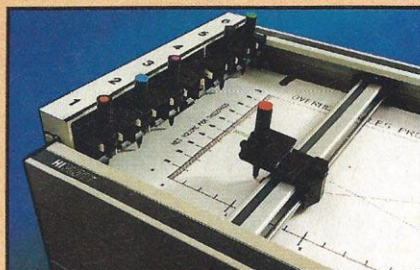
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SPECIAL REPORT

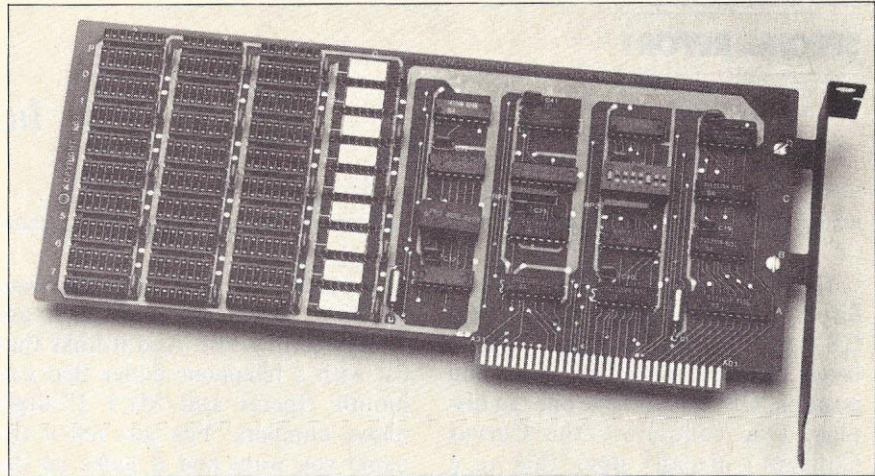
board, because dynamic labeling lets you shift to new labels as needed. When you choose one of the functions labeled, the program goes to that function and the key labelings on-screen change to a submenu indicating the functions appropriate to that particular task.

More memory can also help out when you say "Help!" Each piece of software you use could include a diagnostic module to get you out of a wide range of jams. Many problems result from user error. The error often lies in sketchy instruction manuals and software that just quits when you don't stroke it right. That's because the programming needed to account for all the wrong moves you could make takes a lot of time to write—and a lot of memory to store. As memory capacity gets larger, the more we'll be able to expect—and demand—the convenience of wrong-move programming.

Another convenience is having one command subsume a bunch of subcommands. In RAM-limited programs, aids to ease like this have to be weighed against not including some valuable functions. It's comparable to a car with a large engine being able to handle a variety of power-consuming options without lowering overall performance. Many small cars are very sprightly when they're allowed to travel light. But strap on luxury features and they just die. Powerful high-level commands are the computing equivalent, along with the other things listed here.

From our viewpoint the highest-level command is a sloppy one and computer literal-mindedness is a prime cause of user hair-pulling. With an approximate-input function the computer doesn't just sit there and wait for you to put things exactly right. Instead, it goes halfway to meet you. Large memory can give room for approximate input as well as for master commands.

The Savvy adaptation for the Apple handles approximate commands



The DSI-EX64K from Davong Systems (Mountain View, Calif.) is a 64k RAM card that easily expands to up to 256k with the addition of individual memory chips.

now, for instance, using 48k RAM and a virtual memory system. Virtual memory is when you have a lot of program on the disk and the computer goes to it for what it needs all the time. You could think of it as a heavy-duty overlay design that works with both the program and your data. An Apple disk drive holds over 100k of magnetic memory. So if Savvy needed all that in a virtual memory system, you could get it from a RAM the size of two Apple disk drives (that's the size of the Apple III's maximum RAM, by the way). And the convenience of having a computer that actually tries to figure out what you want it to do would be even more convenient contained within a large on-board memory.

It may seem indolent to seek convenience features when most of us use computers for accomplishment more than entertainment. But busy people learn to use conveniences to let them focus on their highest-quality tasks. Still, once we've managed to handle our current level of productivity most efficiently, we then seek ways of accomplishing additional things. One of the first you should consider is wrapping all that RAM around existing minicomputer software.

A new way of doing things

Speed and convenience features of added-memory computing save time. Most personal-computer users use the saved time to tackle new or larger-scale tasks. Another way to save time by adding memory is to use the enlarged capacity to do several tasks at once.

Computers generally strive to elec-

tronically duplicate manual ways of doing things. Thus one early word processor had ratcheting knobs on either side of the CRT (Cathode Ray Tube). You'd use them to scroll the electronic display up and down.

Technological innovation often automates a prior way of doing something. Then the new capabilities get exploited and do things the older manual system couldn't. The first movies duplicated stage plays. Now the camera swoops around in even the most routine movie. Personal computing is generally still in the filmed-play stage, but really new ways of doing things hover on the horizon.

Possibly the most striking area is in multitasking. Human beings tend to do one thing at a time. Part of that comes from the way most people's minds work and computing can't change that. But it can change the ways in which given tasks are set up.

Most professionals make their livings doing a variety of tasks under given job descriptions. Each task often requires assembling the relevant files and apparatus. So we tend to do one thing at a time to economize on the trouble it takes to get in a position to work.

Computers are like that, too. Want to do spreadsheeting? Boot a spreadsheet program, get the right diskettes and do it. Likewise, for writing a letter or report, converting tabular data into graphics, communicating with remote computers, etc. But with more memory you can work on all of these at once, setting the computer to one or several tasks while you continue to enter data, organize and/or write.

**“Added memory
can give you a
luxurious, arms-spread-out
kind of feeling.”**

Imagine a computer with several displays, each represented on one big CRT by separate “windows.” These boxes can be changed in shape and position. Or you can have one big display. One computer—the Corvus Concept—already does this as a matter of course. And it has a large enough memory (256k standard, 512k possible—maybe more later) to run several software programs at once.

Let’s say you’re working on a report and need to do some calculations based on data in your database as processed by your spreadsheet, then turned into a graph and inserted into your report. Meanwhile the home office calls and wants something entirely different called up and sent to the other office via modem and telephone. You could open a bunch of windows and do it all simultaneously, meanwhile continuing work on your report. You wouldn’t even have to wait for the graph. You’d just put a marker in the report where you wanted it to go when it was done, and continue.

In other words, instead of spending what seems like hours each day organizing your work, you just DO it.

Being able to display enough to handle such a work flow requires large memory. It takes many bytes to control the shifting, multiple imaging with graphics, and text from different programs, all on screen at once. The Corvus has the hardware to do this kind of display, and others have or will have it shortly. We’re just waiting for the software.

Optimization with The Organizer

Beyond this is the concept of optimization, which is being espoused by Fred Kallopy of Conceptual Instruments (Philadelphia, Pa.). This company makes an expanded-memory Apple program called The Organizer. The Organizer is an integrated, multifunctional program designed for people managers—i.e., executives—and it needs a 64k RAM

to work. It lets executives stow away all those notes they make that are always getting lost. And it links that list with a telephone dialer that can handle Sprint and MCI 27-digit phone numbers. You just tell it the name you want and it looks up the person’s file, reads the phone number and dials it. It is linked to an appointment calendar and tracks important appointments, chiming (via the Apple’s speaker) an alarm to tell the user to look at the screen and see what it is he or she needs to do. Thus far we have an efficient combination of filing system and personal secretary. But Kallopy sees beyond that.

Kallopy holds that most business decisions are still being made seat-of-the-pants. He says today’s manager uses a lot of quantified data and formulas—then guesses his bottom-line decisions. With a massive amount of memory, Kallopy anticipates that a manager could feed every significant variable into the system on his desk—for, say, scheduling the vehicles in a 100-city trucking operation, or ordering components for a complex assembly line. It would then solve a very large number of simultaneous (interdependent) equations and come up with a bottom-line scheduling recommendation. Kallopy says the algorithms (problem-solving routines) exist today. They just have to be written into programs for large-memory small computers available to run them on.

Computer war games

There are unpredictable variables in any business operation, starting with the fleshy production units called human beings. But a computer running optimization software could take ranges of variation into account. The idea isn’t metarigidity, but the business equivalent of a fast-moving tank corps that, unlike Patton’s, never outraces its supply lines.

If hardware is the tank, than software is the supply line and it’s stretched a bit thin. Computing sys-

tems are highly evolutionary—especially software. Nothing is fixed—everything is being constantly updated, revised.

But updating software can be a bear. Small-computer software is often written in assembly language, very tightly. This packs it into the smallest RAM possible, but it’s hard to get into the program and revise it. Programs written for extended RAM, on the other hand, tend to be written in higher level languages that are much easier to get at when the author has a better idea—or finds a bug. Good programmers tend to have their time filled with creating programs—so users often have to wait for updates. And when you get used to a piece of software it can be desirable to stay with the commands and working style you’re used to—if revisions keep it competitive with newer programs.

Make sure, when you buy more memory, that you have at least one useful program that takes advantage of it. That way you’ll be a lot more patient waiting for everything else to come along. Hardware almost invariably precedes software, and the further you go beyond the average, the longer you may have to wait. Apple 64k software is becoming common now—especially professional-aimed programs. But 192k programs are few and far between. The only one we know of is VisiCalc with Saturn’s pre-boot (you boot the Saturn mini-program, and then plug VisiCalc in).

Besides software shortages other potential pitfalls include: making your machine incompatible with others it needs to interact with, pouring upgrade money into an obsolete machine you should replace, voiding your warranty; paying more for expandability in a computer when you don’t plan to use it, losing your respect for backups just because you have a big on-board memory, taxing your computer’s cooling and power supply systems, problems with physical fit, and suffering from gadgetitis.

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SPECIAL REPORT

Say you augment your Apple II to 64k and do VisiCalc on it. Your boss with his Apple III won't be able to read your files in Apple II emulation mode, which is limited to 48k. There is a solution to that, by the way. It involves using an Apple utility program to translate the Apple II files into Apple III-type files, which the Apple III's VisiCalc can then work with, and which the II's can't read. So you're still stuck if you need upward and downward compatibility. When you petition your boss for the extra memory you're excited about, remember to include every other machine whose diskettes and memories you swap stuff with in your proposal.

The wrong machine

Are you upgrading a computer you should be giving a gold watch and a rocking chair to? Some early personal computers are truly obsolete. If it's out of production, why not give it to the son with the mad scientist gleam in his eye instead? Other computers still work well but never caught on, so there isn't much software for them. Don't buy by specs and features—buy for utility and track record.

Yet other computers work well and have software, but the maker has gotten a reputation for coming out with new models incompatible with the old ones. Your system could be next! So look for makers with demonstrated user loyalty before you add memory (or any other upgrade). However, some types of personal computers use a standardized expansion slot design (like the S-100). If you get a new machine of the same slot design, you can often put your memory boards in it. You have to stay with the same bus design and sometimes with the same manufacturer, though.

Other wrong-machine problems: There are early S-100 (that's a semi-standardized expansion slot design) computers of wretched quality that no amount of upgrading will save, because they'll still be unreliable. Also, some "S-100" machines won't run

S-100 boards from other manufacturers properly. Make sure it works before you pay. On the other hand, Radio Shack Model III's and Apple II Plus' are a safe bet because there are so many of them. Even if new machines can potentially do this or that better, they have so much software available and their designs are so proven and well known, that you can expect years of utility. This is true, to varying degrees, of many other machines. A friendly chat with your dealer's repairman could be one of the smartest moves you could make.

Another wrong-machine problem is lack of headroom. If you know your uses will require 256k RAM in six months and your machine can only be expanded to 128k, maybe you should wait to get one that has the headroom you need.

Your warranty—remember?

If you break a seal (for instance, on Radio Shack cases) or solder things you can void your warranty. On the other hand, if you keep any parts you've replaced while expanding and restore everything back to factory configuration before you go in for warranty work, you should be OK. If you want full factory support, you can buy the factory expansion card or chips—if they make them. At the least, we strongly recommend buying your expansion memory from the same dealer you bought your computer from.

You rarely have to solder to add RAM, anyway. It's usually just a matter of plugging in chips or a RAM card, and sometimes pulling a chip on the motherboard and replacing it with some small device connected to the RAM card. That will void most warranties, all right, but since nothing is soldered nothing is irreversible. If you're worried, you have several options. One is to get a RAM card (like Mountain Computer's) that doesn't require swapping motherboard chips. The other is to

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get your dealer to warranty the whole expanded system himself. This works best if he's competent and authorized to repair your computer himself.

Unused expandability

Few who make highly expandable machines will remind you that the cost is there whether you use the the expandability or not. A number of high-performance personal computers do not lend themselves to expansion. But they cost less to design, build and maintain. Because they have fewer parts, their circuits don't have to be designed to coordinate with the variety of boards and gadgets you can stick in them. Thus the Apple is more expandable than the Atari, even though both have the same processor and basic specs. The Osborne, Cromemco C-10, and Xerox 820 all offer low prices for what they do, but that does not include much expansion ability. When you have more parts, more things can go wrong. Good complex computers (like Cromemco's high-end line, Tarbell, Vector Graphic) are engineered against this and are priced accordingly for this engineering. Some others are not.

You still have to back up

A motorcyclist will crash at some point. He has to plan for it. You will lose everything in your RAM at some point. And you have to plan for it. The bigger the RAM, the harder you'll fall.

Memory expansion devices usually go into your computer and draw power from the power supply. A few are outside and separately powered—no problem with them. Every computer's power supply has a limit, and it may be wise to find out just how much power each card you have in there draws and compare the total against the power supply's output. Some power supplies (like the Apple's) are very conservatively rated. But if your machines gets squirrely a power shortage might be the cause.

External power supplies are made for some machines (like the M&R for the Apple, or Mountain Computer's Expansion Chassis, which offers extra slots and a separate power supply). Transistors are susceptible to heat. Typically they perform OK until they blow, and then you have to replace them. Most heavy-duty machines have fans or massive heat sinks, and add-on fans are made for other popular makes. A RAM board does not by itself require extra cooling, but if your machine is already highly expanded it might be prudent to put a fan on. Check with your dealer on your own brand's idiosyncrasies.

You can buy RAM, like the mountain climber's credo, “because it's there.” Sometimes it's easier to get another goodie than to learn to really use what you've already got. We're not against impulse buying; it builds sales and lowers prices for the rest of us. The world would be a thin place without pioneers. Every time we buy hardware for which a full assortment of software doesn't exist, we're making a prediction about the future, varying from a pretty sure bet to a pretty ridiculous assumption.

Now you've seen the landmines. The most serious is buying more memory and assuming that software to run it automatically exists, and has no hitches. This is still a new business, and you may have to invest some time and trouble to get what you want. The second most serious pitfall is expanding a machine you should give to someone.

What's available now

If you want more memory now, you can get it via chips, cards, boards and boxes. They are available for machines designed to expand and for ones being put to uses the original maker never intended. There is a trend toward combining extra RAM with other functions on the same card. This conserves expansion slots and often power requirements as

well. Cards are coming out with as many as four or even five different kinds of hardware on them—often including RAM.

Extra memory generally costs from .4 to 1.4 cents per byte, with the larger memories usually running a bit less per byte. Prices range from tens of dollars for chip sets, to \$100 for low-cost computer cartridges and cards, to \$100 to \$225 for 16k cards, to a \$1000 or more for big disk emulators with 300k or more. S-100 64k boards cost from \$225 to \$1000. The cost per byte is about the same, whether the form is electronic (RAM) or magnetic (disk drive) memory.

Generally, cheap, turnkey machines—for a given level of performance—have limited expansion potential. Apple, Commodore, Corvus, DEC, IBM, NEC, the S-100 machines like Vector Graphic, and Zenith all offer machines that are quite memory-expandable. Peripheral manufacturers focus on memory products for the most popular of these at any given time. Makers including memory products in their lines include Mountain Computer, Davong, Microsoft, Tecmar, Axlon and Memotech. Memotech is unique in offering a 64k stick-on memory for the tiny Sinclair.

There are some related products, too. Print spoolers with dedicated RAM are offered by Quadram and Practical Peripherals. You can only use their RAM to make printers more “intelligent” (so they can print while you use the computer for editing).

While many RAM cards can be used with suitable software as disk emulators, some devices (like Axlon's 320k box) are hard-wired as disk emulators. Again, it's a specialized application of RAM—maybe it should be called DAM (Dedicated Access Memory)—but it's so useful and you don't need to wait for software. The Axlon has an uninterruptible power supply for its own RAM, though it

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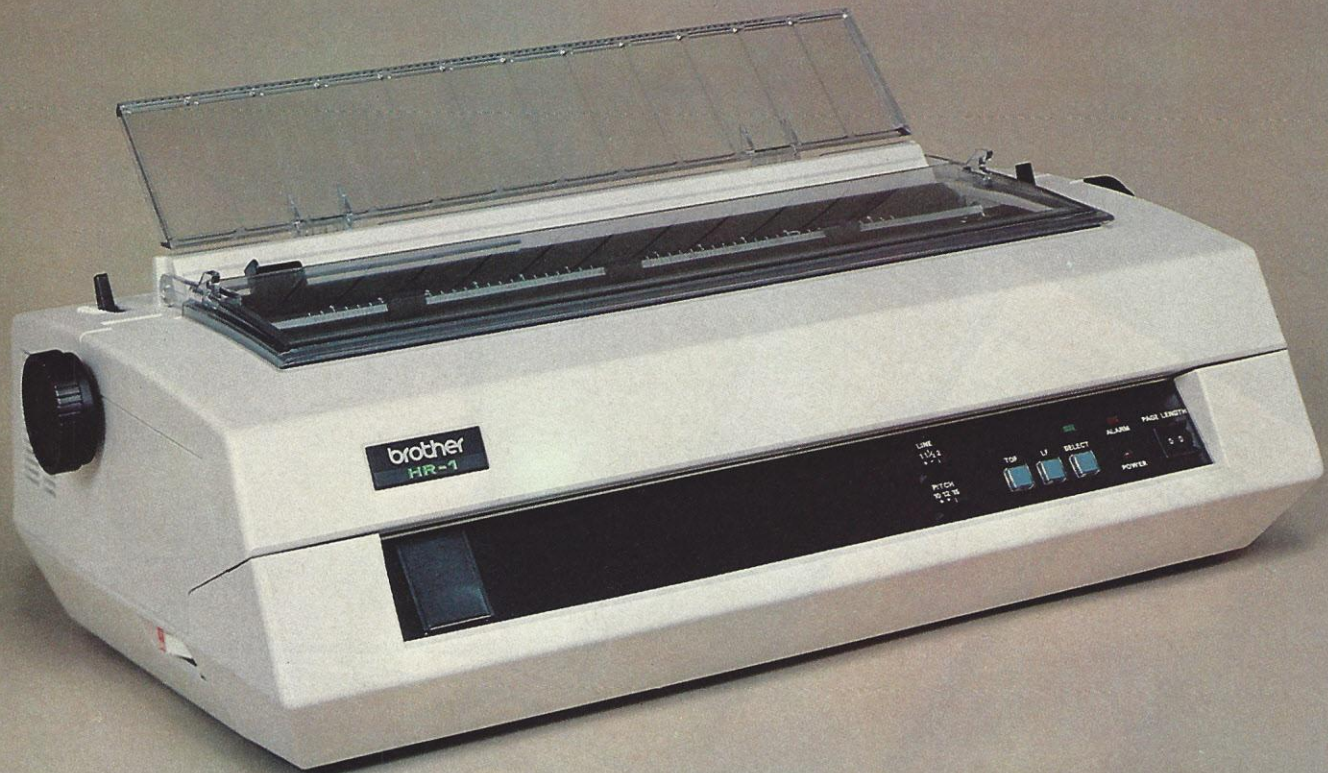
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doesn't protect the RAM of the computer proper.

Add the RAM yourself?

We believe you should add RAM yourself whenever possible. Manufacturers like you to have the dealer install chips and cards, if for no other reason than if you use incorrect or low-quality products (or botch the job), they don't want you blaming them for the results. But that's their problem. Yours is to become confident with computing. It's comparable to learning how to do very minor work on your car—the worth isn't really in saving the cost of someone else's labor. It's in the sense of mastery and competence such work gives you with the computer, or car, or whatever. You don't have to become a hobbyist to stick a card in, and it's not difficult.

Can my software use the RAM?

A chart sufficient to fully answer that question would fill a book and be outdated before the type was set. But we've included a sampler chart listing some software firms making products that can take advantage of extra memory. Some categories of software are especially memory-hungry—like spreadsheets, data-base managers, and word processors oriented to long reports and articles. The makers of added memory hardware should publish lists of software that use their product. Call or write them and say you want it. If enough of us do they'll provide it.

As a rule of thumb, every category of software includes programs for the casual to the serious user, and the latter is the place to look for high-memory software. The fact that the IBM and Apple III can be configured with a large memory has spurred competitors (notably Commodore) and software makers to jump. We think you'll see significant programs using a lot of RAM by next year. It's limited now, as we've said, but we've also pointed out some programs (no-

tably spreadsheets, The Organizer, program compilers, and disk-intensive data-base managers using disk emulation) you can use now.

Context Management System's program purports to do for the manager what The Organizer purports to do for the executive—to be the one program the user uses, keeping it fired up on an ongoing basis. The MBA is aimed at MBAs and their ilk. It requires a 256k IBM.

That 256k gets you the five functions managers use most (word processing, data-base management, electronic spreadsheet, business graphics and telecommunications)—all in the RAM at once, with one set of integrated commands for the works.

It would take much more than 256k of program and data space to have each of those five functions as powerful as specialized, single-purpose programs. The word processor, for instance, has 13 commands as opposed to the 50 to 70 found in some others. But few managers need the kind of word processing a production typist needs, and don't want to have to learn all those commands in the first place—or relearn them every time they want to key in a quick letter.

MBA is a practical, available-right-now program that needs 256k of RAM to work right. If enough IBMs come to have larger memories, MBA's creators are ready to do a 512k version with more features, speed, data space, as is Conceptual Instruments' (makers of The Organizer), and most other software-producing firms.

While waiting for the software you want there are other ways to get at the benefits of added memory.

Large-capacity disk drives (especially hard disks), offer much faster disk access than floppies because they spin so much faster. They reduce I/O waits. Their costs start at \$2000 for 5M drives and go straight up from there. Your software just won't use all that. Without some changes, the


average program will treat the 5M like a regular floppy and give you DISK FULL messages when it's put a floppy-full of information on it. Legally, you can't place copy-protected programs on hard disks. Do it illegally and you lose factory support. It's best if you regard hard disk drives as another, expensive system upgrade you can contemplate. We certainly like them. They're just not a panacea.

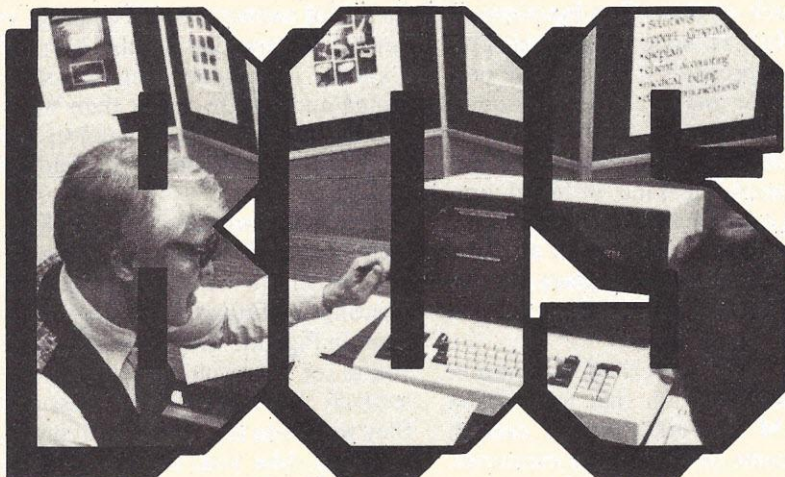
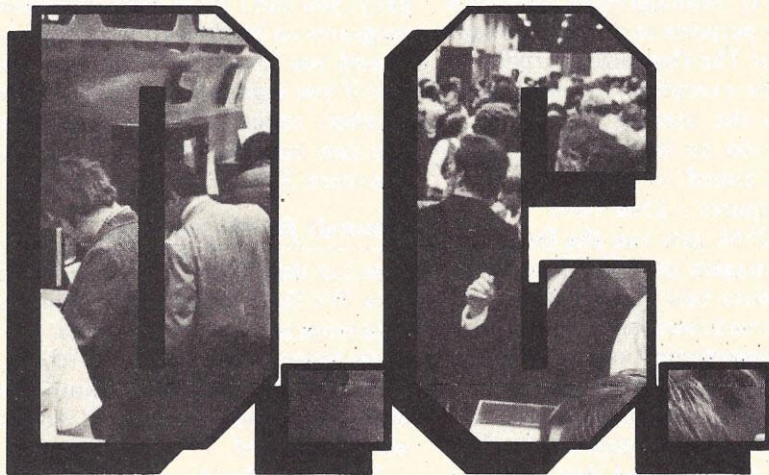
Rewards for the intrepid

You can do it if you try, as the song says. We don't promise that memory expansion is the easy way to go. Pioneers travel rocky roads, after all. But we hope you now know the bumps and the Beulah land you're working toward.

You must decide whether to pop for added memory now. Tempting as our dreams are, that humble burro of a system you've got is reliable, sure-footed and a sight better than walking. But we have one last conceptual argument to make in favor of added memory.

The programmers—all of them, from Microsoft's think tank in Bellevue, Wash., to some bright teenager creating the future in his dad's basement in Piggott, Ark.—are looking at you to see what you'll do. If you, collectively, buy more RAM, be assured they will write to it. They're dying to, but they, like you, have to make a living. They have to write for sufficient numbers of users to constitute a market.

So added memory may turn out to be a self-fulfilling prophecy. If you get the memory and brag about it to all your friends and associates (perhaps skimming over some of the late nights you put into solving the problems) you will have that Pegasus on your desk quicker. And, by virtue of your pioneering you'll be prepared to exploit it quicker than your more truculent peers. You may even be able to keep up with the computer-confident kids just starting to emerge from college now. It's up to you. 



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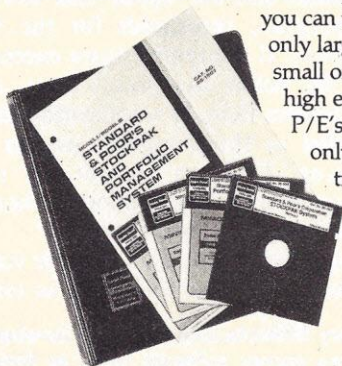
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The Smart House Comes Of Age

From solar power to energy conservation, personal computers are taking some of the exotic ideas that came out of the 1970s' energy crises and putting them within reach of the innovative homeowner

by Mike Barlow

You've heard of smart bombs and smart terminals, right? Well, get ready for smart houses.

Houses that think? Yes, thanks to personal computers programmed to react as weather conditions change, as people enter or leave a room, or as the temperature of a hot tub gets too hot for comfort. It may sound like some overzealous engineer's idea for an electronic dreamhouse, but don't be misled. The so-called smart house is becoming more common as its potential for saving money through efficient energy management is cultivated.

There's a new breed of personal-computer users taking advantage of a wide array of hardware and software configurations designed to monitor and analyze energy use in the home with an eye toward cutting utility costs. And they're not only using their computers to save money on the traditional forms of energy, the fossil fuels. They're also putting them to work designing solar- or wind-powered homes as well as retrofitting older homes with all kinds of exotic energy-related devices.

Take the case of Russ Coffman. When he wakes up on a cold winter's

morning in his solar-heated home near Denver, Colo., his Apple II Plus has already raised the shades, allowing sunlight to begin warming the seven-room house. And from that point on, the computer "stands guard" over fluctuations in temperature. Through a network of sensors, the Apple monitors all temperature changes, and when the house gets colder, the computer turns on a fan to circulate air that has already been heated in a solarium on the south side of the home.

At night, the Apple switches on a bank of exterior security lights, but keeps them dimmed to conserve energy. However, the computer is programmed to turn the lights back to full-intensity if an intruder is detected by the array of infrared and ultrasonic sensors implanted around the property.

And there's more, some of it leaving the realm of necessity and going off into luxury. If Coffman takes the week off to ski, the Apple turns down the heat in his hot tub for that week, and turns it back on a few hours before he returns.

So with all his energy worries apparently covered by his Apple, Coffman, a former computer salesman, has had more time to think about marketing some of the ideas that went into the building of his

smart house. He has developed a software package called Tomorrowhouse, for energy-conscious homeowners. In selling this product, Coffman is banking on the hope that the energy crises of the 1970s have worried the nation enough that it will act on its annually spiraling fossil fuel bills.

A computer warning

Tomorrowhouse, for the Apple computer, enables its users to display on the monitor the on or off state of lights and appliances, the temperature readings of 16 locations around the house, and daily temperature range data—high/low temperatures and the times they occurred—for each of these sites. Additionally, the user can set upper and lower temperature thresholds for the 16 locations. If the temperature exceeds or falls below the preset limit, an Electronics Echo II voice synthesizer coupled to the computer sounds a warning. This can prevent, for instance, sensitive greenhouse plants from dying on a cold night.

And if you don't want to leave your warm bed on that cold night to tend

Jeffrey Milstein used programs developed by two energy software firms to design this sunspace for his N.Y. home. In his office there (inset), he runs simulations and analyses for other solar projects.

Mike Barlow is a journalist from New York State who writes regularly on business and science topics.



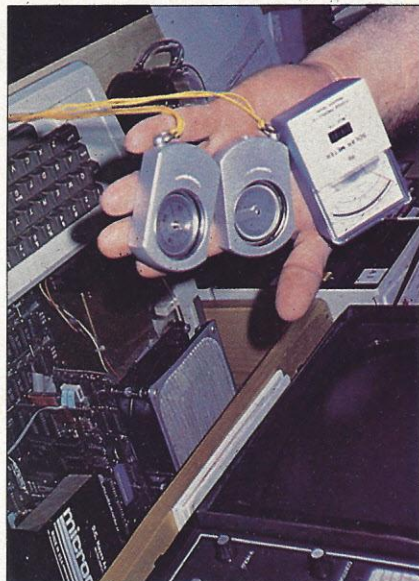


to the greenhouse plants, Tomorrowhouse—when equipped with a 48-channel interface board and some add-on circuitry—will instruct the Apple to control the heating of that site, making adjustments every half-hour as it surveys the temperature sensors.

The user can also create seven, 24-hour temperature “profiles” for the house, with up to 48 adjustments per day. This way his home can be set up to react to his schedule. For instance, the profile can instruct the computer to reduce heating to minimum levels on Tuesday when no one will be home, and restore the heat on Wednesday when the family returns. “With this system, you can always come home to a warm house and a hot bath,” Coffman says.

On the computer monitor, Tomorrowhouse shows a high-resolution graphic of the home’s floor plan, and details the sites where electrical appliances or temperature levels are being monitored. With the addition of a second disk drive, a year-long

John Hardie at his Boston solar home (above left). Using energy software in his office there (below left), he sends solar building information to hand-held terminals taken to the construction site.



"A Yardley, Pennsylvania solar home is a mixture of Rube Goldberg's designs and Stephen Spielberg's special effects."

record of temperature variations and system responses can be compiled, creating a data base for future study. Coffman projects that the system, which costs \$3200 without installation, can cut home energy costs by as much as 30 percent annually.

Earlier this year, Denver developer Britt Blaser met Coffman, watched the Tomorrowhouse program in action, and was so impressed that he drew up plans to include the system in each of the 120 solar-heated townhouses he's building on 14 acres in nearby Littleton, Colo. But Blaser wants to take Coffman's system a step further. He plans to link up the Apple computers located in each townhouse to the Corvus Omninet network, and monitor and control energy consumption at the development on a multiunit scale.

Selling technology and shelter

A graduate of Wesleyan University in Middletown, Conn., Blaser bills himself as a developer of solar-heated, energy-independent luxury homes. He feels that he's on the cutting edge of a new kind of housing industry. "We're selling technology as well as shelter," says Blaser. "Most heating systems in America are designed on the premise that the average home is full of leaks. For years, the solution has been to blow hot air into the house faster than it leaks out." But with fuel costs skyrocketing, those energy-wasting solutions are no longer feasible or even conscionable, he says. "Instead, we have to rely on new information and ideas to help heat our homes. We can't continue to just throw materials at the problem."

Blaser's homes are of the double-wall or envelope variety. The heavily insulated homes are "ground coupled" so the earth itself acts as a thermal collector, storing heat energy and keeping interior temperatures from fluctuating more than 10 degrees year-round.

"Ever notice how your basement is

warm in winter and cool in summer? That's because the earth is always about 55 degrees, no matter what the temperature is like above it," Blaser explains. The result of the earth-coupled, double-shell design is to effectively wrap the basement around the house, virtually eliminating the need for heating in the winter and air-conditioning in the summer.

But this design alone is only 85 percent effective. All that's needed to achieve that last 15 percent, Blaser says, is Coffman's contribution—a computer programmed to monitor temperature fluctuations and to make appropriate responses.

For most of the winter, a passive solar greenhouse with a southern exposure provides all the heat energy needed to maintain Blaser's homes at a comfortable temperature. But if the weather remains extremely cold and cloudy for several weeks, ground temperature will drop and cooler air will begin circulating in the space between the home's inner and outer walls.

That's when the computer takes over, Blaser says, opening vents and turning on a fan that blows hot air from a sun scoop atop the house into the cavity between the walls. This warms the house with only a minor expenditure of energy. "The emphasis is on brains rather than resources," Blaser adds.

A touch of Goldberg & Spielberg

By most people's standards, the Tomorrowhouse concept is the kind of idea that is still reserved for futuristic fantasies. But not by Joe Winegardner's criteria. Winegardner, a professional energy management consultant, lets a Hometech 80-85 personal computer do his energy thinking for him. And the way his house works makes Coffman's design seem primitive by comparison.

Winegardner is a former Western Electric engineer who designed computers for industrial control applications. He spent \$8200 to integrate the

Hometech into his 14-room home in Yardley, Pa., and the results are a mixture of Rube Goldberg's designs and Stephen Spielberg's special effects.

When the smoke alarm goes off in Winegardner's home, the heating system shuts down, the exit lights go on, and the drapes open to allow easy exit from the house. On the other hand, if the burglar alarm is tripped, all the lights in the house go on, the drapes and roll shades close, dialer alerts the police and a video monitor in Winegardner's room shows him exactly where the break-in occurred.

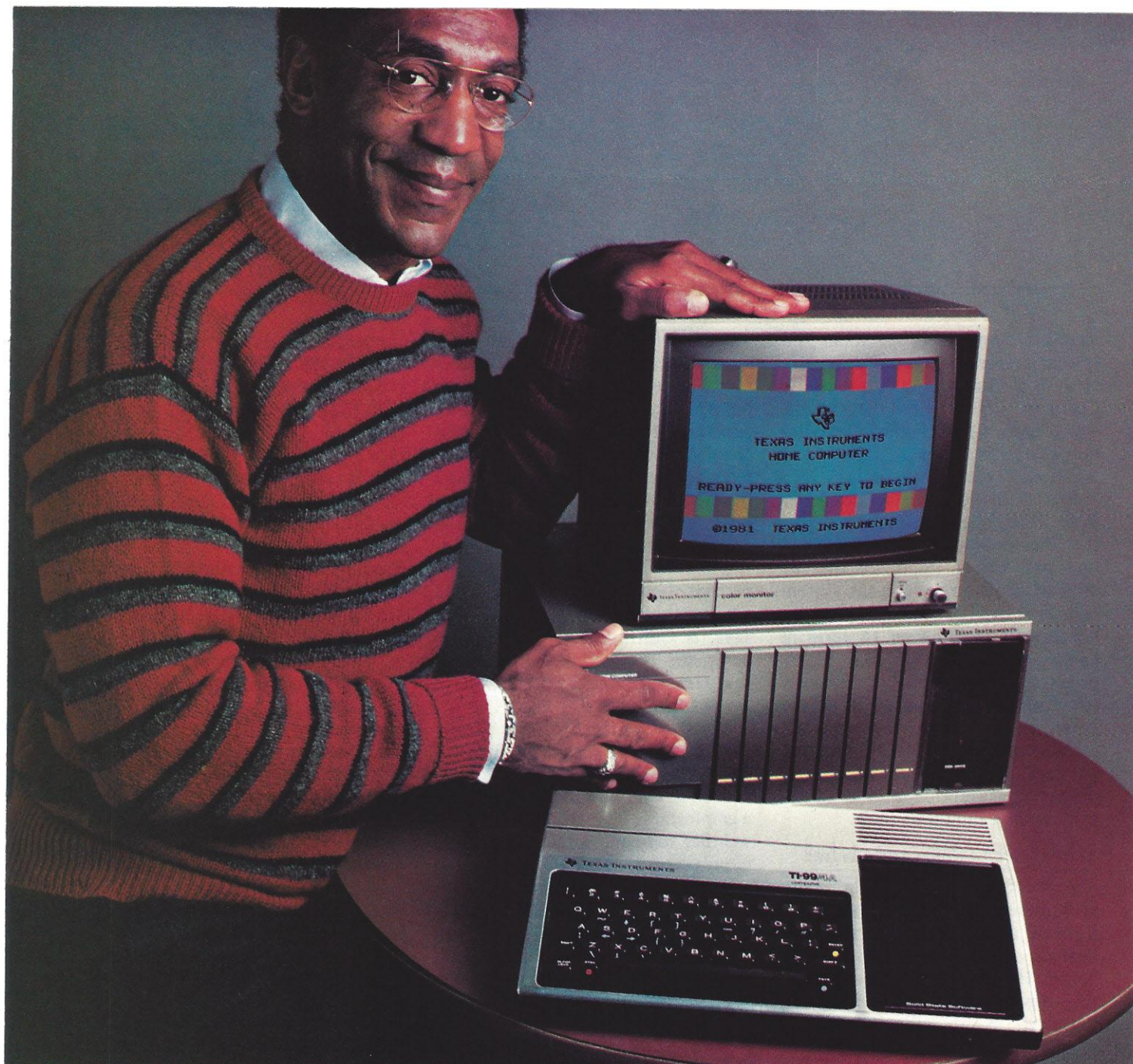
Utility bills lowered

And that's just the start of a litany of tasks that the computer takes on. It keeps the hot water heater turned off except when Winegardner takes a shower or does the laundry, which results in an energy savings of 37 percent annually. It also determines when it's best to start moving air warmed on the south side of the house into cooler rooms. Photocells keep the computer from turning on house lights until it gets dark, and motion detectors make sure that lights are off in unoccupied rooms until someone enters. Moreover, the computer is programmed to turn down the heat at night and not turn it back up until 30 minutes before it switches the stereo on in the morning—the stereo awakens Winegardner and his wife.

With the help of his personal computer, Winegardner says, his utility bills are 50 percent lower than those of his neighbors. But he cautions that before installing a system like his in the average house, a homeowner would be wise to consider his economic condition carefully.

"If you have limited funds for investment, it's best to put the money elsewhere," Winegardner says. "If you're looking for a six- to eight-year payback, it's just not that interesting."

Solar industry consultant Jon



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CIRCLE 5

"This is the cutting edge of a new kind of housing industry that's selling technology as well as shelter."

Hardie agrees with Winegardner's assessment. As President of Dequid Associates, a Boston-based firm that specializes in marketing management, computer analysis and sales strategy for solar projects, Hardie believes that personal computers have the potential to save enormous amounts of resources, but only if their powers are harnessed wisely.

Using a personal computer to monitor and control energy use in a home that has not been designed with conservation in mind is likely to be an exercise in futility, he says. Instead, why not attack the problem at its root by using the computer to help redesign the house?

Optimizing solar plans

Many homes, Hardie notes, aren't properly oriented to receive the full thermal benefit of the sun's warming rays. However, he adds, often a design that appears impractical can be turned into an energy-saver with simulated testing on a personal computer. So, using software developed by the Princeton Energy Group (PEG), an energy think tank at Princeton University, and Solarsoft, a software house based in Snowmass, Colo., Hardie runs simulations and cost-benefit analyses designed to optimize his clients' solar plans.

He runs the programs on a 64k Apple II Plus outfitted with three disk drives. The Apple is tied by modem into a 68k Pixel 100AP "super mini" made by Instrumentation Laboratories of Andover, Mass. Completing Hardie's set-up are a Wantanabe six-pen flatbed plotter, an NEC Spinwriter and an Epsom MX-100 printer. Hardie's clients take to the construction site IXO hand-held microterminals, which allow direct communication between the site and the computer in Hardie's office. This way clients can run the simulation program as they are going through the process of constructing the homes. Moreover, if any advice is needed, they can call Hardie

up and ask him to explain the data that just came over the computer.

And standing in the sunspace of Hardie's home in Arlington, Mass., a suburb of Boston, it's not difficult to believe that the marriage of high technology and common sense has finally been consummated. "Every square-foot of south-facing glazing equals a gallon of oil saved," beams Hardie, who delights in showing guests the results of his labors.

Beneath the floor of the sunspace are 27 tons of fist-sized rocks which act as a thermal sink capable of storing 1.3 million BTUs of heat energy. Sitting on the floor of the sunspace are 14 67-gallon Kalwall tubes of water that store a total of 700,000 BTUs. When the outside temperature rises during the day, the sunspace is prevented from becoming intolerably hot by the rocks and water, which trap a good deal of the incoming heat. When the outside temperature drops at night, the stored heat becomes available to the rest of the house. "I've got two million BTUs, roughly the equivalent of 22 gallons of oil sitting here, and it's all sun-fired energy," says Hardie.

Hardie did the computations that led to the design of his sunspace by hand, a tedious process that took several months. Now he uses a PEG program called Microfix to design similar projects for his clients in a fraction of the time.

One of four personal computer programs developed by PEG, Microfix simulates air and mass temperatures in a sunspace on an hour-by-hour basis over a period of days. The program, designed specifically to help professionals and do-it-yourself sunspace builders, also yields figures on hourly excess heat, a daily summary of total heat loss, and the maximum air-flow rate needed to remove the excess heat each day.


"Microfix is a very good program to cut your teeth on," says architect Jeffrey Milstein. He used the PEG and Solarsoft programs to help de-

sign the sunspace for his house in Woodstock, N.Y. The design was so successful that he offered do-it-yourself plans through the mail at \$11 a copy, and received 1300 requests.

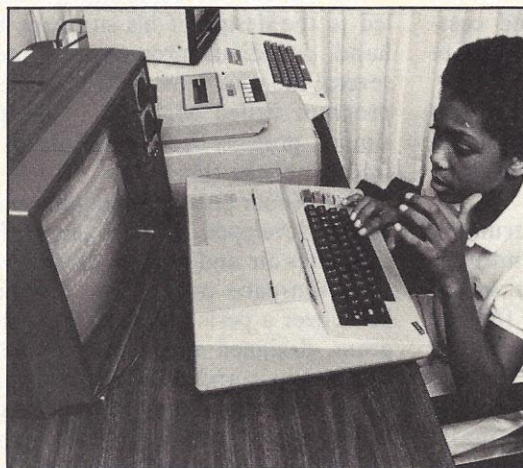
Solar construction scenarios

To calculate the temperature shifts that would occur in his sunspace, Milstein used a Solarsoft program called T-Swing. The program allowed Milstein to play out a variety of "what-if" solar construction scenarios. For example, he could plug in different thermal masses and interior dimensions for the sunspace, and the computer would graph temperature swings for each range of variables over a 24-hour period.

With another Solarsoft program, Solgain, Milstein determined the ideal length and height of window overhangs at his home. A well-designed overhang can prevent 90 percent of the sun's energy from entering a window during the summer when the sun is high in the sky, and allow 90 percent of the sun's energy to enter a window during the winter when the sun is low. "Solgain lets you plot graphically the sun's angles hour by hour, and lets you see the solar energy gain hour by hour," Milstein says. "It's very impressive."

That last statement is heard more and more from architects and consultants working with personal computers in solar-energy projects or energy-conservation systems. Many in this field say that one of the prime reasons that solar power has failed to catch on dramatically is, put simply, poor marketing strategies. The average consumer has avoided seemingly exotic energy plans for fear that they are too complicated and cumbersome for his needs. But reflecting on this recently, these same experts are now saying that the personal computer, with its ability to simplify information and work in tandem with its users, could be the push that the solar-energy industry has waited for to make it marketable. 

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*From a review in the "Instructional Computing Newsletter"; MECC, May 1982.

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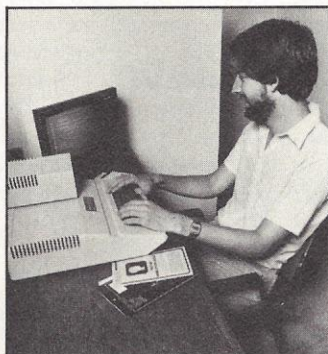
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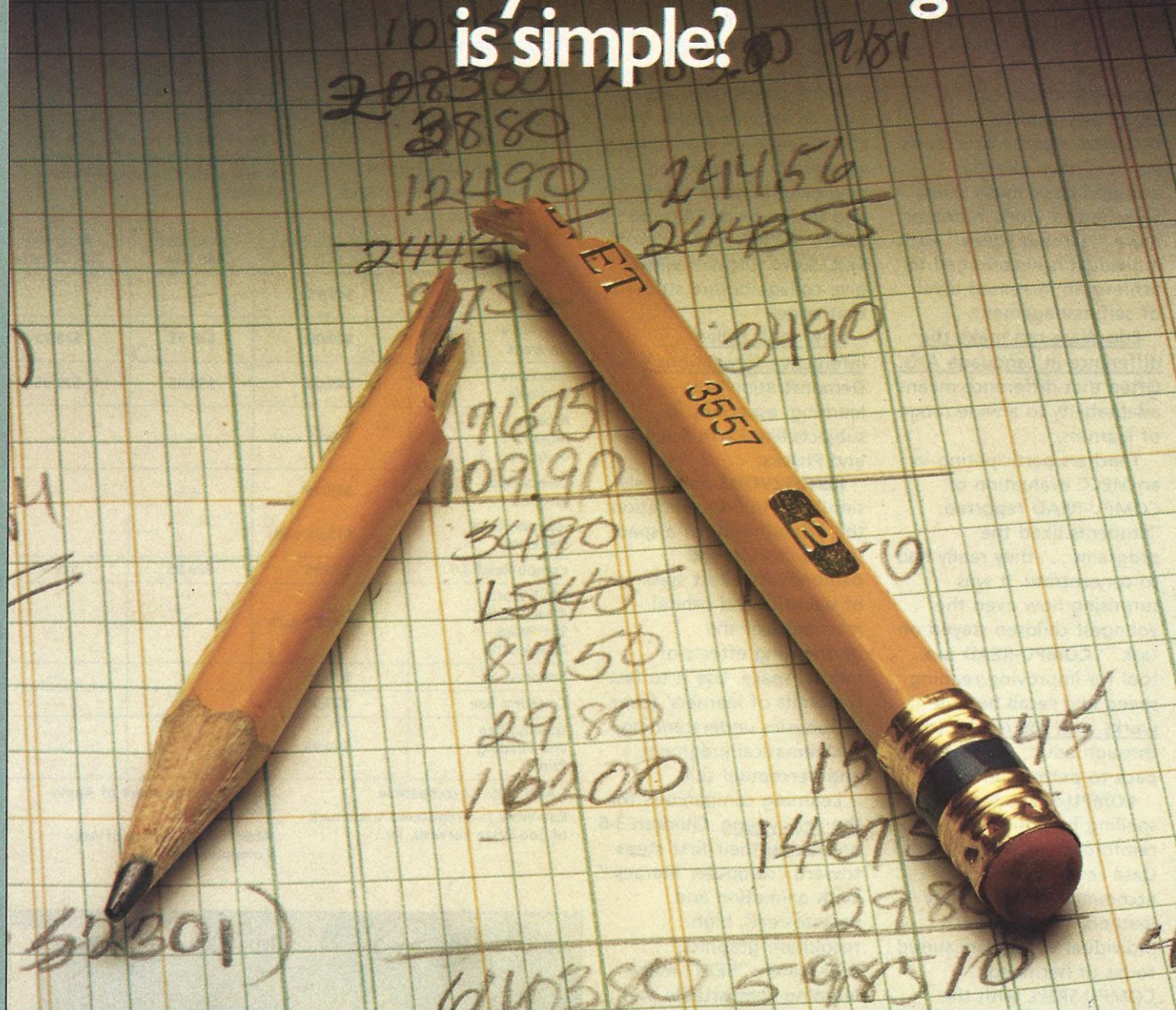
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SAT Tutoring Programs: Give Them An Incomplete

Cramming for the Scholastic Aptitude Test that weighs heavily in college entry used to be an arduous memory drill. Personal-computer tutorial programs are making the preparation more enjoyable, but it's too early to tell what they do for scores

by Tom Cullem

Tutorial programs currently available for personal computers can: (choose one)

a) Raise a student's score on the Scholastic Aptitude Test (SAT) 50 to 150 points and improve scores on other standardized achievement tests.

b) Not do anything more for the SAT-taker than programmed learning with paper, pencil, teacher and workbook can. That could mean an increase of only 10 to 20 points.

c) Take advantage of artificial intelligence techniques that a human tutor can't duplicate—at least not at the same cost per student.

d) All of the above.

e) None of the above.

For the moment, the correct answer seems to be a combination of (d) and (e). That's because reliable tests of personal-computer courseware for SATs and similar exams just haven't been performed. So it is pretty difficult to know the value of computerized SAT tutoring. There is some evidence that commercial programs can help boost standardized test scores. But, as with much research into computer-aided instruction (CAI), scientists still aren't sure

why this is so. Some observers even argue that good old-fashioned drill-and-test teaching may help a student survive achievement tests equally well.

Considering how long computers have been in the classroom (about two decades), one would have thought that some shrewd grantsman in academia would have wangled a fat contract for correlation of CAI



Many students find prepping for SATs and similar exams easier when the computer asks the questions.

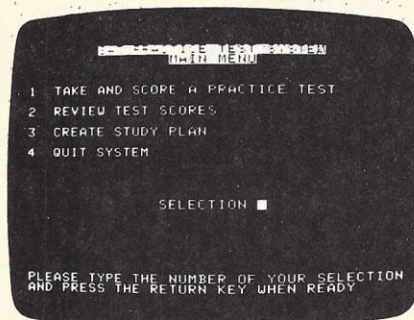
and SAT. After all, the SAT and similar exams like the Preliminary SAT (PSAT), the National Merit Scholarship Qualifying Test (NMQT) and American College Test (ACT) play a big role in determining collegiate fortunes. "Not only does performance on these tests play a key role in gaining admission to many colleges and universities, but it is often a critical factor in the awarding of several types of financial assistance, particularly 'no need' grants," says Borg-Warner in promoting its Microsystem 80 courseware for college entrance exams.

Making the grade

Academic officials decry the attention paid to entrance exam scores, and say that high school grades and letters of recommendation are often more important in admissions decisions. But they don't seem to have convinced college-bound students and their parents. "Just having the name SAT in a courseware title is a draw," says Wendy Peterson, marketing director for Edu-Ware of Agoura, Calif. "Kids and parents are very sensitive about scores." Peterson also thinks that such concern has encouraged the growth of SAT tutoring services like Stanley H. Kaplan Educational Center, N.Y., and that it could also help Edu-Ware

Tom Cullem, a Long Island-based writer, keeps his fingers on the pulse of the computer industry.

“Just having the name SAT in a courseware title is a draw. Kids and parents are sensitive about scores.”



Computer SAT, from Harcourt Brace Jovanovich, starts with the main menu . . .

sell its new SAT “Word Attack” series, introduced in June.

Software vendors have good reason to be eyeing the SATs. More than one million students take the test each year, making it about the biggest standardized test in the U.S. More students take standardized reading tests, but these vary from state to state and aren’t so amenable to commercial exploitation.

Book publishers have already cashed in on SAT-fever, with the most famous handbook, Barron’s *How to Prepare for College Entrance Exams—SAT*, selling over two million copies since 1954. But software sales look to be an even bigger money-maker. Whereas Barron’s sold perhaps \$1.6 million worth of its books last year, one of the leaders in SAT software sold \$1 million. The company is Krell software of Stony Brook, N.Y., which has been in the SAT preparation game about 26 years less than Barron’s.

So the market for SAT programs is there, and the vendors can’t wait to satisfy it. But the question remains: Will SAT programs do the job?

What kinds of results?

At the moment, there isn’t much objective evidence to go on; SAT software hasn’t been around long enough for quantitative evaluation. Most such work is still in the planning stages. Harcourt Brace Jovanovich (HBJ) plans to test the new

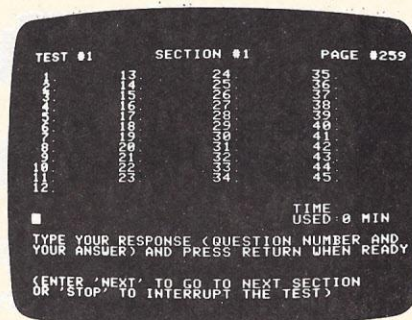
computerized version of its book, *How to Prepare for the SATs* at three schools later this year, while Edu-Ware hopes to run experiments with its courseware in up to 107 “beta-schools.”

Some researchers have already reported gains with SAT courseware. Stan Silverman, coordinator of computer programs at Hempstead High School in New York, is one of them. In a rough test that is, nonetheless, state-of-the-art as far as personal-computer SAT research goes, Silverman made various college entrance exams available to 30 seniors. Half the group had access to courseware from a diversified group of vendors, and the other half software from Krell.

The students, who had all previously taken the SAT without benefit of CAI, logged in at terminals at their own convenience. They worked without a teacher, but with a teacher’s aid. After an average of about eight hours of computer study, the two groups retook the SATs, as did another group of 60 seniors who did not participate in CAI. The results: The group that used various software posted a 22-point improvement vs. the non-CAI group, and Krell users scored an average of 77 points higher.

Is that anything to cheer about? Maybe. SAT scores range from 200 to 800 on each of two sections: one for verbal aptitude, the other for math. So combined scores range from 400 to 1600. At Hempstead, where the average combined score on the first test was about 900, one set of software may have boosted normal performance by about 3 percent; another set may have increased it 9 percent.

“Seventy points more on the SAT could be important for some of our kids,” Silverman says. But he warns that his results should be treated gingerly. He is uneasy about his small sample, and advises teachers at other schools that they might not



. . . which directs the user to several options, among them the test answer sheet.

have the “hardware intensity” needed to duplicate his success. “We had a 1-1 ratio of students and PET terminals,” he points out. In many other schools, kids are lucky if their share of terminal time adds up to 30 minutes a day.

The Educational Testing Service (ETS) considers a 10 to 20 point score improvement normal, according to William H. Angoff, executive director for ETS’ technical division, so the lower range of Silverman’s results doesn’t seem significant. However, the reason for the increase is unknown. But the upper end approaches the magic 10-percent or 100-point figure that parents and students can relate to when they weight the tradeoff between software and cold cash.

Krell chairman Ed Friedland thinks 100 points is far from the top when it comes to SAT score improvement. The firm has come out with a more advanced version of the courseware Silverman used, and is reporting even better results. “People are telling us that their mean score improvement is more like 150 points,” Friedland states. He is so confident of Krell’s “College Board Examination Series” that he is organizing a nationwide tutorial franchise, with a “money-back guarantee” that CAI can raise SAT scores. His goal is to have six or seven CAI centers in operation by the end of December.

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EDUCATION

"The market for SAT programs is there. Vendors can't wait to satisfy it, but will the programs do the job?"

YOUR SCORES ON PRACTICE TEST # 1				
	NUMBER RIGHT	NUMBER WRONG	NUMBER OMITTED	RAW SCORE
VERBAL	0	0	85	0
MATH	0	0	60	0
TSWE	0	0	50	0
TOTAL SCORE				
VERBAL	200			
MATH	220			
TSWE	20			
PRESS M TO RETURN TO MAIN MENU				

Once the user takes the test (in the manual provided), the program gives the score. . .

Judy Priven, who directs a computer-aided tutorial clinic in Maryland called "Reading Power," has also had good results with SAT software. Using a combination of programming and conventional tutoring, Priven finds she can increase combined scores about 100 points. "Math is usually a little harder to bring up than English," she notes. "Probably the main problem for kids is that the SAT can cover a wide vocabulary."

The vocabulary vacuum

To help students survive in the vocabulary vacuum, Priven developed a "word attack" program that teaches about linguistic roots, prefixes and suffixes. The theory is that a student can work out the approximate meaning of a strange word by breaking it down into its parts. This talent can pay off in multiple-choice questions about antonyms and synonyms.

Edu-Ware Services has been selling a version of Priven's software since June. "SAT and PSAT Word Attack Skills" are each twin diskettes for use on a 48k Apple II. For the suggested retail price of \$49, the student receives 12-lesson modules and 14 tests, two of them comprehensive. Eventually, Edu-Ware will offer a four-part series for both the SAT and PSAT, with the antonyms and synonyms each to be joined by twin diskettes for analogies, sentence completion and reading comprehension.

Priven used "Word Attack" in a recent tutorial class, but outside of general reports that students found it valuable, has no way of knowing how useful it was. "My own kids probably used the program more than anyone else," she says. "Every Saturday morning they were at it for an hour or so."

Likewise, Paul Peterson, brother of Edu-Ware marketing director Wendy Peterson, was another big user of the initial "Word Attack" series. "We have the results back, and he did well," Paul's sister says, "but since he didn't take the test before, I don't know how much credit to give to the software."

Enthusiasm is lacking

While programmer testimonials support the value of SAT programs, some observers haven't seen the enthusiasm extend to the general run of customers. "I haven't heard people say they love any of our test-preparation programs," reports Elliott Greene, whose New York-based Computerland store has consistently been ranked in the chain's top 5 percent in sales. "But we haven't heard any big negatives, so I guess the programs do some good."

Greene thinks high prices are keeping many personal computerists away from educational software in general, and that consumers are not yet convinced courseware is superior to books. "You don't need programs that give you the same multiple-choice questions and answers. You don't need an electronic scratchpad." Instead, Greene would like to see "more heuristics that would help a student recognize where his shortcomings are," and more programs that automatically replace a wrongly-answered question with another one of equal difficulty. That way, the student receives reinforcement for corrections. Finally, he is waiting for "some of the imagination that goes into arcade games to go into games that teach."

CATEGORY	# RIGHT	OMIT/WRONG	STUDY PRIORITY
I. ANTONYMS	0	25	HI
II. ANALOGIES			
A. MEANINGFUL SENTENCES	0	10	HI
B. DETERMINING CATEGORIES	0	10	HI
THIS IS THE FIRST OF TWO SCREENS (FORWARD), OR (STUDY PLAN MENU)			

. . . and the program then develops a study plan based on the user's test performance.

Various program providers hope to give people like Elliott Greene exactly what they want. In addition to cottage-style specialists like Krell and Edu-Ware, many publishers are eager to get into college entrance courseware and educational software in general.

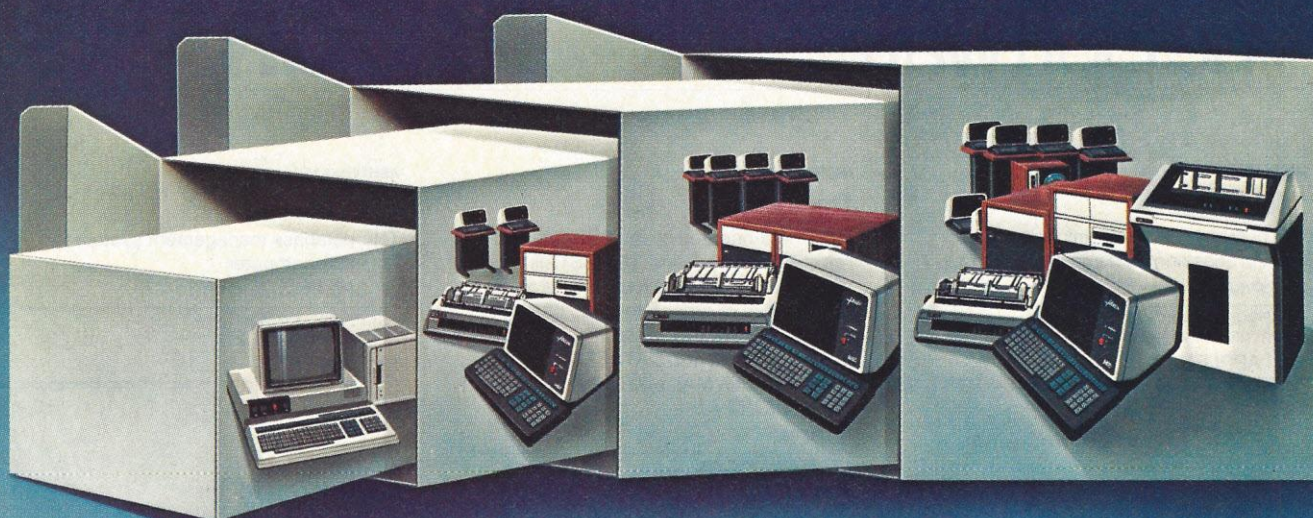
Happy to oblige

Borg Warner's "College Entrance Examination Preparation" (CEEP) is among the major entrants in personal-computer courseware. Part of the MicroSystem 80 education library, CEEP has been out about a year. It has 56 instructional modules on 12 disks, test questions similar to the SAT, good estimates of likely SAT scores, and an overall game plan. In its lesson mode, the Borg Warner system provides hints and explanations that help clarify questions and also analyzes right and wrong answers.

On price, if not performance, CEEP is the cadillac of SAT software. It costs nearly \$1500: \$575 for five disks on antonyms and synonyms, and \$875 for seven disks that cover advanced verbal skills, plus mathematics. One reason for the fat sticker-price is a sophisticated teacher management system that supposedly lets teachers track up to 1000 CAI learners simultaneously.

According to statements by Borg Warner executives, the company's

(continued on page 128)



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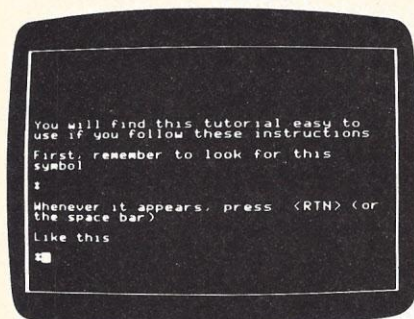
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Edu-Ware's PSAT Word Attack Skills offers a tutorial on the program's use. . .

SAT TUTORING PROGRAMS

(continued from page 124)

management algorithms can provide a detailed analysis of student performance in all categories, prescribe future study based on student strengths and weaknesses, and determine if spending more time drilling a particular skill is likely to improve the student's score.

The management system Borg Warner sells makes sense in its major market: schools. Educators also express appreciation for the rental deal on CEEP: \$180 for the first year a subscriber holds the package (\$1450 face value) and \$90 a year renewal rate thereafter. But the rental rate isn't available to consumers.

Sophisticated software

Fortunately, many personal-computer users won't need a big management system. As Stan Goldberg, president of Micro Lab (Highland Park, Ill.), points out, some of the sophisticated programs now available can force students to study what they need to study most; but some of this is common sense. "You don't need someone to tell you to study antonyms when you only get three out of 25 right on the test," Goldberg argues. In any case, the personal-computer user can find promising software ranging anywhere from \$15 to \$300.

The programs offered by Krell are at the high-end of the price scale. But

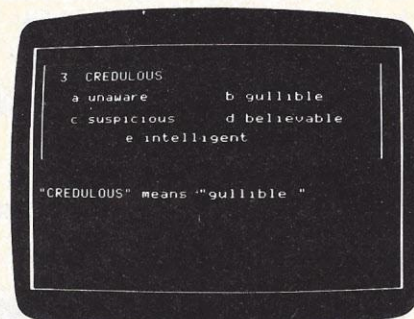
Krell's Friedland says that the sophistication of his company's software more than makes up for its additional price. Friedland claims that his latest software includes "some very clever artificial intelligence applications." He also says that the Krell program diagnoses student problems, automatically channels studies into areas that need more work, and keeps cumulative track of time and score during simulated tests.

Krell's cumulative score feature is a good example of what SAT gamesmanship is all about. In the actual exam, right answers earn a point, wrong ones lose a point and passes count for nothing. The system discourages outright guessing, but the student who can narrow his choice to two alternatives can make some points on the probability that he is right more often than wrong.

"It's funny," says Hempstead's Silberman. "No matter how many times we told the kids not to guess before they took the first SAT, they would still guess." But by seeing during the simulated SAT how each stab in the dark cut down their scores, the students got the message. "The Krell software made it very clear to them how costly the guessing-game can be," he recalls.

Krell's Friedland points to other SAT games. In the math section, a favorite ETS trick is to change units of measure between question and answer, and link up a likely numerical figure with the wrong descriptor. The unwary student who diligently does his calculations but fails to watch out for mines doesn't ace the SAT, Friedland warns.

A Ph.D in Political Science, Friedland takes a libertarian delight in writing software that fundamentally tries to out-game the SAT. "The ETS people don't generate good wrong answers randomly," he points out. "They use likely mistakes" that test-takers can learn by computer simulation.



... then begins teaching some word attack methods using Latin roots. . .

Friedland's latest software is supposed to force program users to follow lesson plans based on computer diagnosis of good and bad points. He also uses random-number programs to ensure that students can't max-the-SAT by merely memorizing test answers. "The structure of the problems may still be familiar to many of them, but the numbers change, which is something that a book can't do," he claims. The whole process "forces them to read very carefully. And as we know, precision reading of problems can make a big difference in how we solve them."

Books vs. computers

If Friedland thinks there are some things a book can't do as well as a machine, traditional educational publishers think just the opposite. Harcourt Brace Jovanovich is a case in point. Officials there think what is needed to propel the SAT software market is a nice fat book like *How to Prepare for the SATs*.

HBJ has put out a 400-page paperback "How to Prepare" book for about a year. Last month it combined the book with a program consisting of a loose-leaf binder, a 32-page user manual and two floppies. The whole deal has a suggested retail price of \$70, or more than 10 times what the book cost. But the price is well worth it, because purchasers get a lot more than they did with the book, HBJ spokesmen say.

“Consumers are not convinced that courseware is superior to books, and its high price is discouraging them from finding out.”

“The disk material doesn’t duplicate the book at all. It expands the instruction section and includes a whole new series of 540 new drill items,” says Kenzi Sugihara, product manager for the “How to Prepare” courseware. He thinks the hard-copy handout is “an enormous advantage,” especially when going up against Krell.

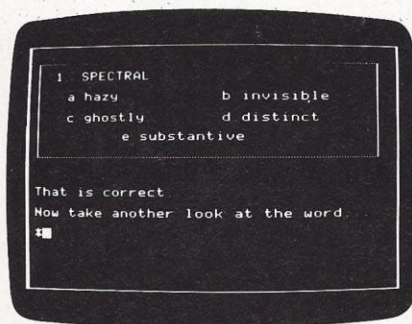
Even for a computer whiz, a hand-book documenting the SAT program is helpful. For a teacher, it is downright indispensable. But Krell’s first software products amounted to “only a few flimsy pages,” Silverman recounts. He was more impressed with the documentation on an analogies program from Program Design Inc. where Krell is supposed to be beefing up its hard-copy effort, but big publishers like HBJ clearly think they have an opening.

At the moment, HBJ is the only big publisher with CAI for SATs. “We will address (the SAT market) before too long,” says Chuck Carlson, systems publisher/school division at Random House. But right now all Random House has for SATs is *Scoring High*, a book that helps students score well on achievement tests.

At Barron’s, home of the leading guidebook on SATs, “electronic courseware is being discussed. But nothing is definitely planned,” a company spokesman reports. And R&D instructional design manager Ellen Smith of *Reader’s Digest* says, “it is too early” to talk about SAT programs. “We’ve only had personal-computer programs out for about a year now, and only for grades K-8.”

On the publishing agenda

Bowdie Marx, a vice president at St. Louis-based Milliken, is waiting for “our big New York and Chicago competitors” to jump into electronic publishing. But he doesn’t think SAT programs will be first on the agenda. “The demand for material is really in the basic skills—math, reading and language arts,” he says. “You don’t



... and finally rewards correct work with positive reinforcement.

find a lot of instructional software after eighth grade because high schools use computers almost exclusively for computer literacy.”

Not surprisingly, then, an educational group reviewed personal-computer courseware last year and found most of it directed toward grades K-8, with “no large commercial package available for high schools” and an emphasis on “skill development and fast recall vs. higher-level thinking.”

What’s the crucial ingredient?

Boosters of SAT courseware depend on a general enthusiasm for computer-aided instruction (CAI) to give credence to their programs. But in fact the record is a bit garbled.

Spearheaded by Patrick Suppes at Stanford University, researchers identified the advantages of the computer in teaching subjects that demand drill and memorization—advantages like repetition, infinite patience, and the ability to tailor program content and pace. Suppes continues to be a champion of CAI, but like many other seasoned researchers, he isn’t sure that the computer is the crucial ingredient in many of the alleged demonstrations of CAI clout.

“There have been a great many studies showing that supplemental work on basic skills improves them,” Suppes notes. “But there’s been research of that kind since the 1920s.” It isn’t necessarily “some magical


property of the computer” that raises the student’s score; sometimes, it is merely the process of programmed instruction. “Every time you produce a well-thought out program for a student, there will probably be some improvement in his score,” Suppes contends.

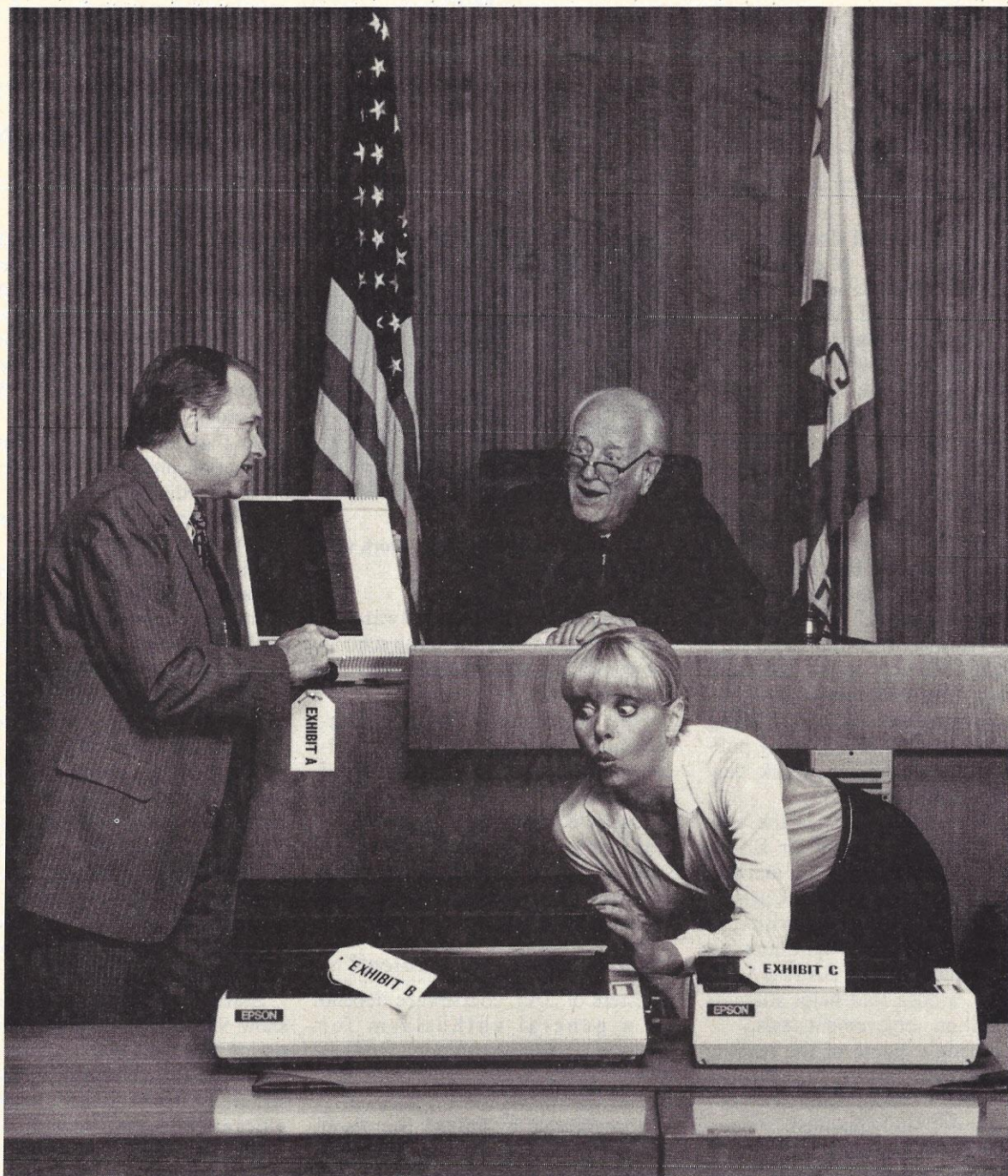
Be that as it may, computerized instruction programs do raise scores on standardized tests.

One recent test illustrates both the promise of CAI, and the perils involved in estimating its impact. Looking at 80 rural students in Lolo, Montana, a University of Montana doctoral student, Sandra Hollingsworth, studied improvement in vocabulary scores for three groups. One group was taught conventionally, with teacher and test; the second group received 10 minutes drill per day on a 48k Apple; the third received precision teaching, which includes continuous review of material and repetitive charting of student progress. The three groups scored overall gains on oral, silent and spelling tests of 8, 15 and 22 percent, respectively.

Statistically speaking, the numbers show 99 percent confidence for the notion that CAI and precision teaching are superior to normal instruction. But they don’t show a significant difference between the two superior methods. So the believers in old-fashioned rote education still aren’t convinced of the computer’s pre-eminence.

Still, despite the rumblings of its detractors, CAI has proven itself in many locales. One of them is Houston, where high school students drill on Apple II computers in 57 secondary schools. According to Pat Sturdivent, associate superintendent for technology, CAI has helped raise high school scores on a state achievement tests.

So, personal computerists, be ready. The day that personal-computer programs improve SAT scores may have just begun. 



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by Leon Starr

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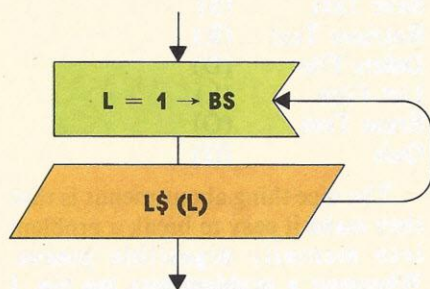
DIM L\$ (BS)

BS = buffer size

Diagram illustrating the effect of the PRINT command with the number of lines specified in parentheses. The diagram shows a series of lines labeled L\$(1) through L\$(12). Lines L\$(1) and L\$(2) are shown as a single line. Lines L\$(3) and L\$(4) are shown as two lines. Lines L\$(5) through L\$(11) are shown as single lines. Line L\$(12) is shown as a single line. A thick black line indicates the actual output, which is a single line for L\$(1) and L\$(2), and two lines for L\$(3) and L\$(4).

PRINT L\$ (3) with two lines

like CTRLs, arrows, ESCs, etc. In fact, it would be nice to have the program look for a particular key to be



hit, like ESC or BREAK, so that it would know when to stop inputting information.

Once the user has entered his text, he needs to be able to make changes. Each type of change would have to be supported by a different routine,

most likely. (Can you see those cars piling up?)

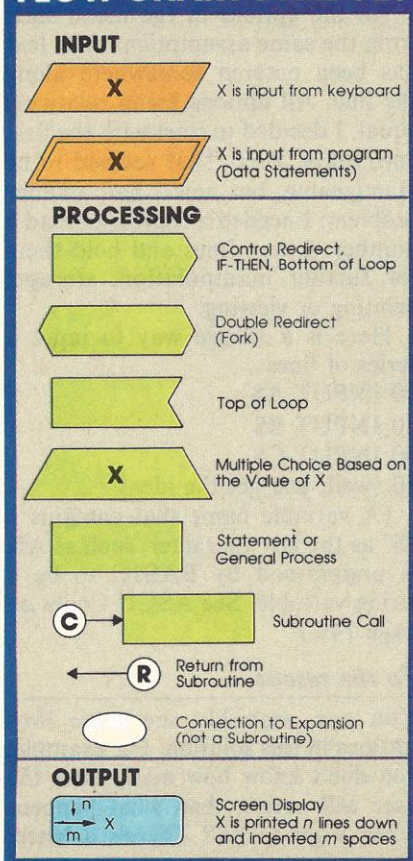
Naturally, I'd have to provide for printing the entered and altered text. But to do that, I had to provide for saving the text on disk. And I'd have to accommodate other disk transactions, like loading and listing available files. There was at least some comfort in knowing that I'd use many of these routines in the index-card file and the appointment calendar. I'd need at least the same disk interactions in both those sections. Records and appointments are both

blocks of text that I could treat in much the same way as the memos and other short documents that the word processor would handle. In fact, I reasoned, the word processor could be common to the entire Desk Master program since it could very well handle the entry of records and appointments.

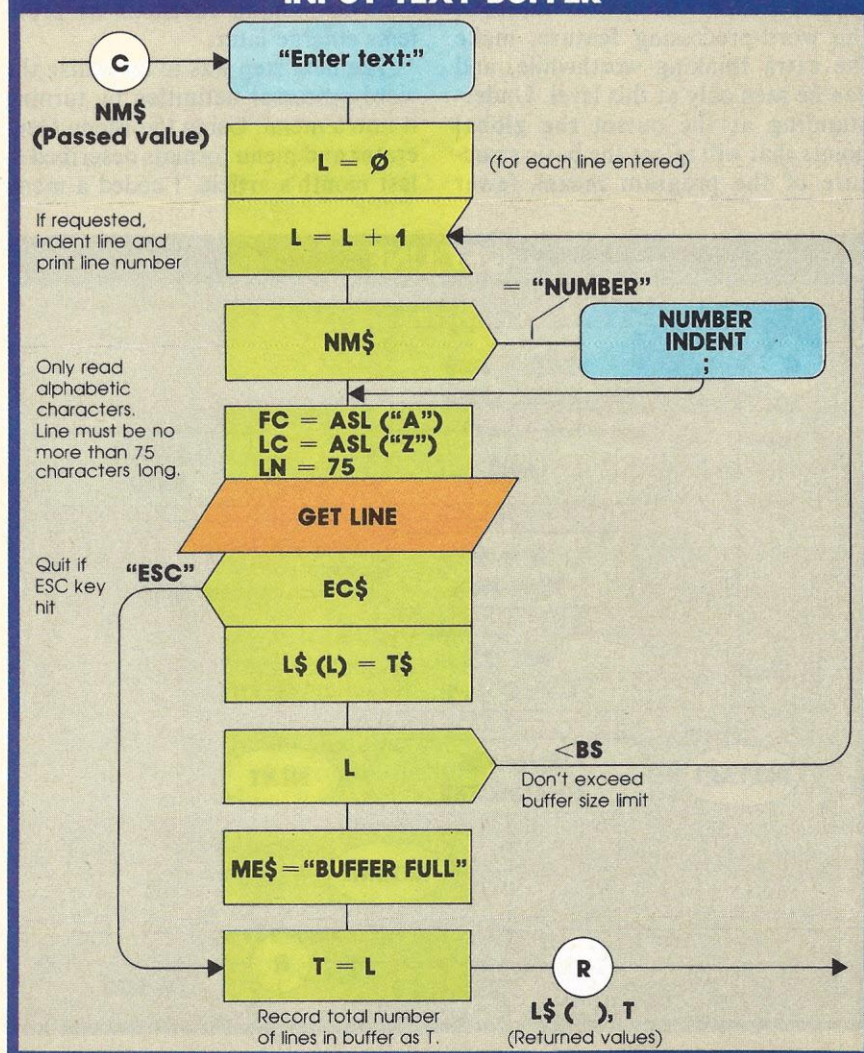
A painful process

This process of outlining the program on a general level can be painful. It shows how big a project you have on your hands. Nonetheless, the insights

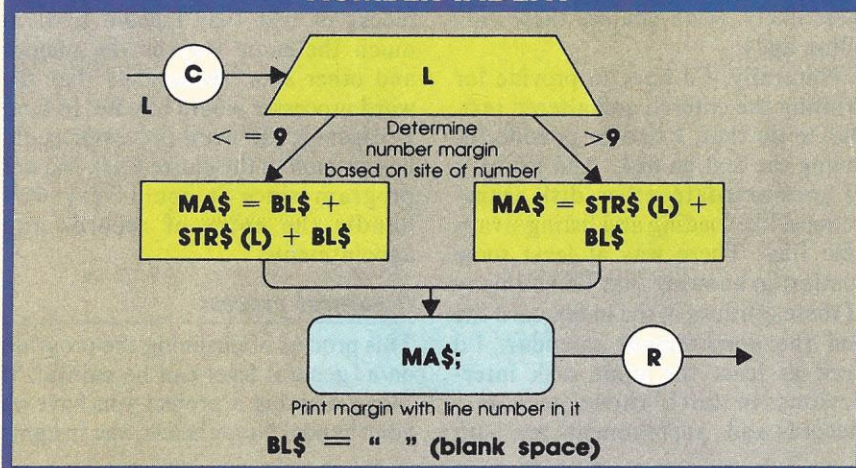
FLOW CHART SYMBOLS



INPUT TEXT BUFFER



NUMBER INDENT



gained, such as the central nature of the word-processing feature, make the extra thinking worthwhile, and can be seen only at this level. Understanding at the outset the global points that will affect the basic structure of the program means fewer

time-consuming revisions as problems emerge later.

The next step was to formalize the word-processor definition by turning it into a menu. Using the Menu Generator and menu formats described in last month's article, I coded a menu

that produced output something like this:

```

Enter Text      (E)
Change Text    (C)
Print Text     (P)
Save Text      (S)
Retrieve Text   (R)
Delete File    (D)
List Files     (L)
Erase Text     (O)
Quit           (Q)
    
```

The nice thing about menus is that they make it easy to break a problem into mentally digestible pieces. Whenever a problem gets too big, I just break it into pieces and attack each piece. Later on I try to puzzle them together from firmer ground. Remember the car analogy mentioned earlier? Trying to solve too many problems at once is like passing too many cars at once. It's a great achievement, and it sometimes works, but it's rarely worth the mental anguish.

All the options in the menu start from the same assumption: that text has been entered somewhere along the line. All options being relatively equal, I decided to start with the first one, Enter Text. That seemed to be manageable, but now I had another problem: I needed a routine to read a number of text lines and hold them for further manipulation, storage, printing or viewing.

Here is a simple way to input a series of lines:

```

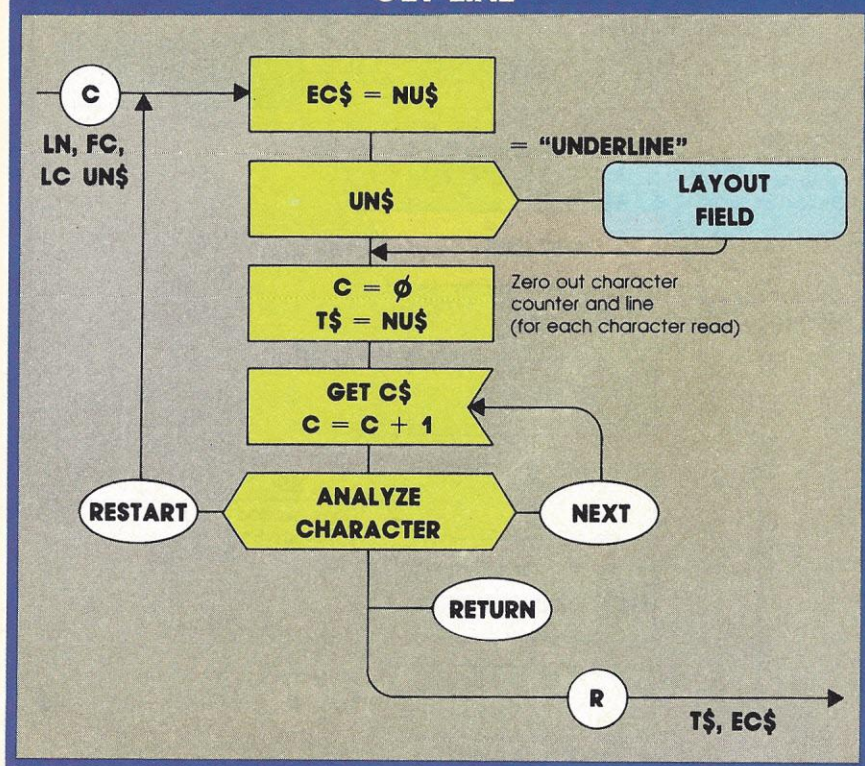
10 INPUT A$
20 INPUT B$
30 INPUT C$
40 (well, you get the idea)
    
```

(A variable name that contains a "\$" as the last character, such as A\$, is understood by BASIC to be a string variable. See ASCII Codes on page 141.)

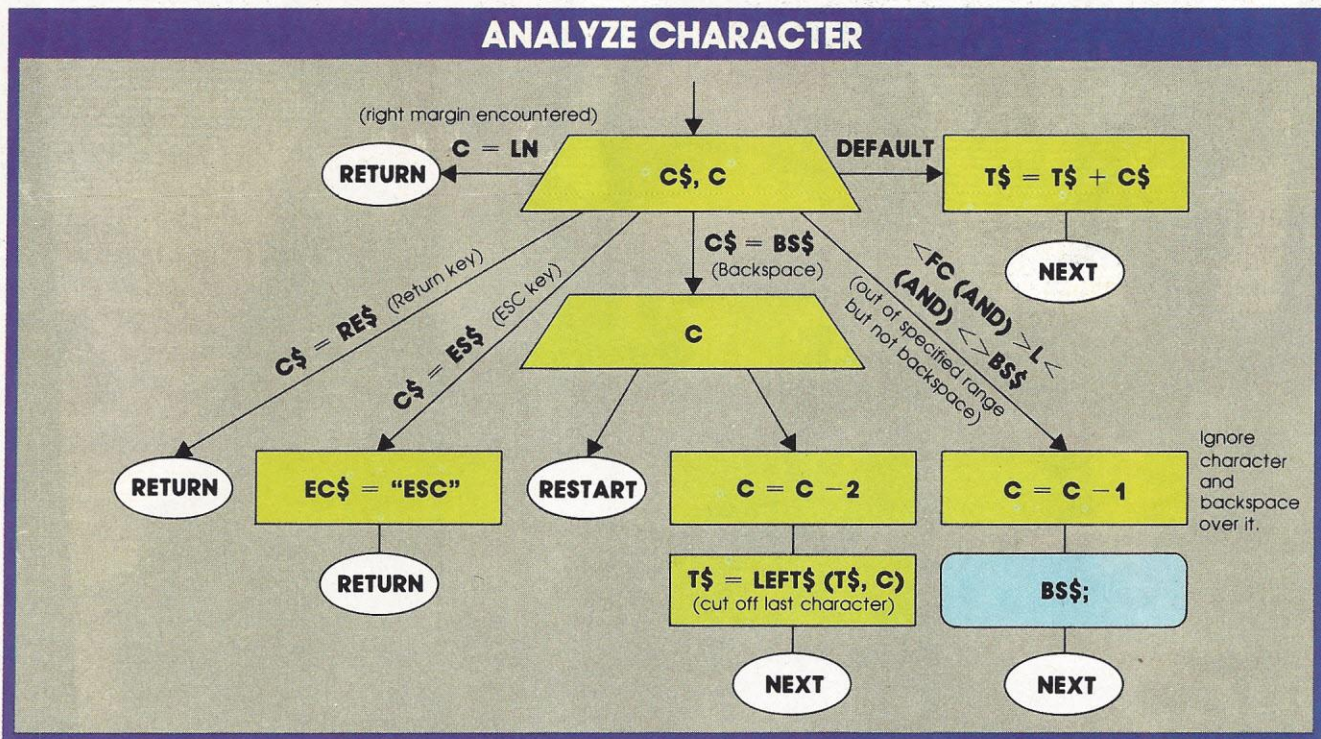
To the rescue

You can probably see some limitations in this solution. For example, you don't know how many lines the user will enter. And what happens when I get to Z\$? There's a better

GET LINE



“Understanding the global points that will affect the structure of the program means fewer time-consuming revisions.”



way to input strings using an array.

The string array is a lot like a sheet of notebook paper that holds many lines of text. Imagine such a sheet with a memo written on it. Let's give the memo a clever name like M\$, and mentally number all the lines on the paper in the left-hand margin. Now, if I wanted to refer to a particular line—number 15, for instance—I would mention M\$(15). Likewise, M\$(1) would represent the first line of the memo.

Just like this imaginary sheet, an array has a limited size. This is always declared at the beginning of the program in a DIM (dimension) statement as follows: DIM M\$(25). The array M\$() can consist of 25 initially blank lines. Unfortunately, not all forms of BASIC let you create string arrays so easily, but most work this way. If yours doesn't, don't worry, the same notion is implemented in some other way.

Here's how this relates to inputting and holding text. I declared a string array that will act as a text buffer,

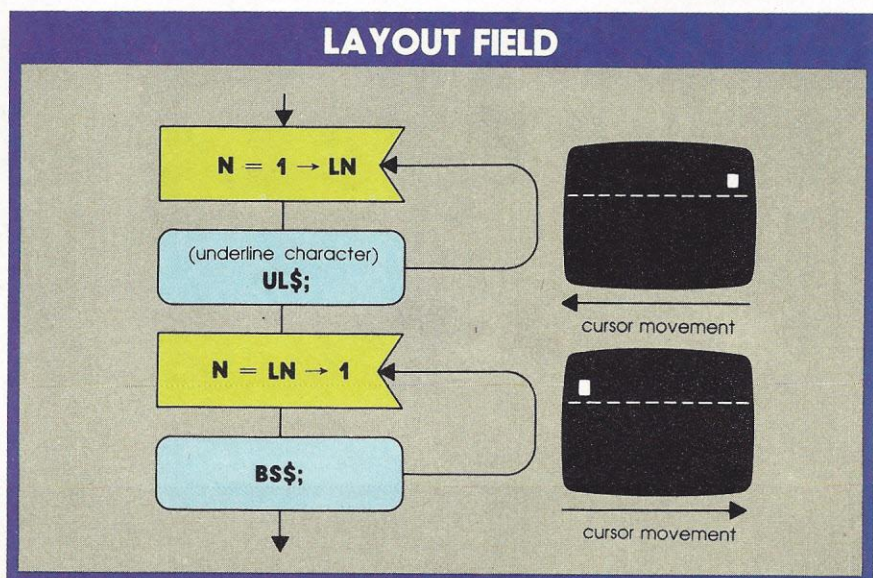
L\$, as follows: DIM L\$(BS), where BS is the buffer size in lines. Then I used the following loop to fill it:

```

10 FOR L=1 TO BS
20   INPUT L$(L)
30 NEXT L
  
```

This loop didn't solve the problem of determining how much text the user wants to enter, but it shortened the program. Still, I knew that wouldn't last, because a more com-

(continued on page 138)



Lay out a field of underlines (UL\$) as long as the expected length of input (LN).



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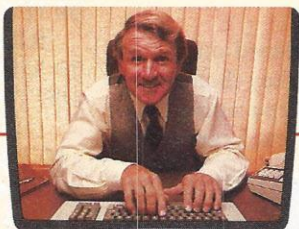
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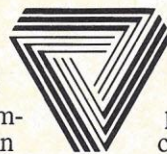
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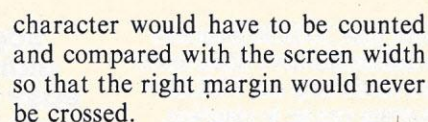
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“Whenever a problem gets too big, just break it into pieces and attack each piece.”



(continued from page 135)

would have to be screened out, so to speak, and the special key that causes return to the memo menu would have to be caught. And each accepted



Since the program was getting complicated again, I broke this problem into two parts. I decided to write one routine to get a line from the user, and a higher level routine that would keep getting lines until some key like ESC or BREAK was pressed. Here is the routine for filling the text buffer that I named INPUT TEXT that calls the GET LINE routine (page 134).

```
10 PRINT "Enter text: "
```

20 $L=0$ 30 $L = L + 1$

```
40 GOSUB 1000: REM GET LINE
```

RETURN EC\$, T\$

```

50 IF EC$="ESC" THEN GOTO
100

```

55 $L\$ (L) = T\$$

```
60 IF L<BS THEN GOTO 30 :
```

```

REM If Buffer Size not exceeded

```

70 MES="BUFFER FULL"

```
100 T=L : REM Set total number
      of lines read as T
```

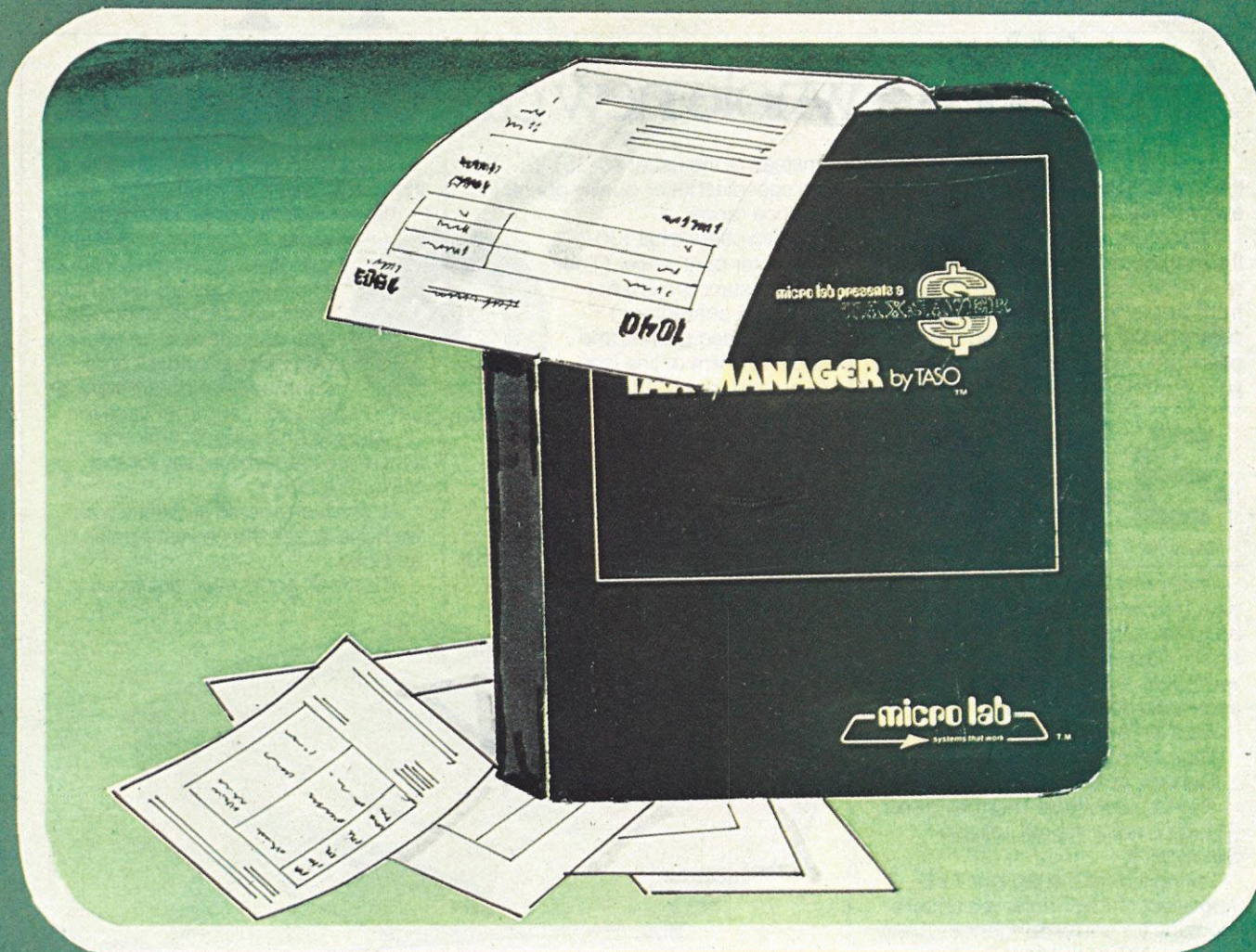
110 RETURN

Since I don't know how many lines will be entered, I can't use a FOR-NEXT loop. So I used the variable L to keep track of which line number is being entered. I set the GET LINE routine aside for later. But there are two things about GET LINE that I do know: The 'gotten' line will be returned as T\$, and if an ESC or a BREAK is encountered, the EC\$ flag will be set to "ESC" (see Analyze Character on page 135). If the EC\$ flag is set, my routine will stop inputting lines, set T to the total number of lines read and return control to the menu. If the user enters enough lines to fill the buffer, MES is loaded with the message BUFFER FULL, which will ultimately be printed by the Menu Generator.

A versatile alternative

I soon realized that I could refine and generalize the GET LINE routine so it would be a versatile alternative to

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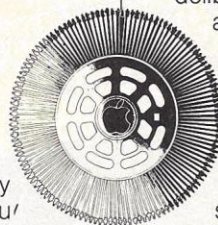
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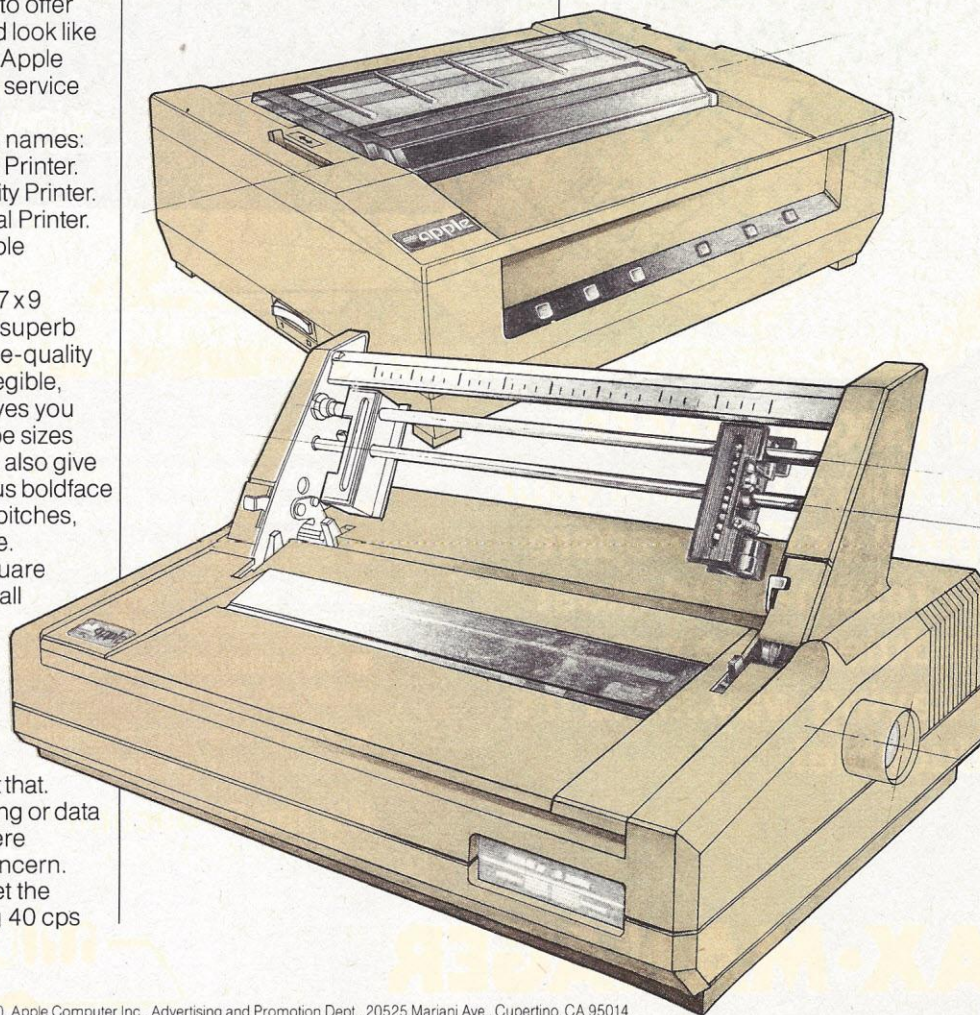
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the INPUT statement. If I made it use variables for the ranges of acceptable characters, (see Input Text Buffer on page 133 for more detail), and for lengths of expected input, along with a flag for line numbering, GET LINE could be tailored for each use. I also wrote it to lay out a line of blanks (underscores), if requested, corresponding to the length of the expected input. So to use GET LINE, all a routine has to do is to set up the variables and flags, call GET LINE, transfer the received line T\$ to the proper variable, and check the ESC flag EC\$ to see if the line was canceled. I eventually put GET LINE into other routines for inputting file names, dates and line numbers.

LINE supplies complete lines to any routine that calls it. The lines are supplied in the variable T\$. But I was able to generalize GET LINE so it is a powerful alternative to the INPUT statement.

First, GET LINE controls the input. Rather than just taking whatever is typed at the keyboard, it screens out any unexpected characters and limits the length of an entered line. Second, I developed a word-wrap routine that grabs the last word of a line, if it stretches over the right margin, and inserts it in the next line. Finally, I made GET LINE outline the line length with a series of underscores if the input is to be only one line (see Layout Field on page 135). Here’s the completed GET LINE routine:

```
660 REM **** GET STRING ****
670 REM IMPORT: LN,FC,LC
675 REM EXPORT T$,EC$
680 REM
685 ES$ = "GET STRING"
690 EC$ = "": T$ = WW$: IF
    OP$ < > "WRAP" THEN
    FOR N = 1 TO LN:
    PRINT CH$(08);: NEXT N
695 PRINT WW$;
700 C = LEN(WW$): WW$ = ""
705 C = C + 1: GET C$
710 IF (C$ = CHR$(27)) THEN
    EC$ = "ESC": GOTO 780
```

```
715 S = 41 - C
720 IF (P2$ = "NUMBER") THEN
    S = S - 3
725 IF (C$ = CHR$(13)) AND
    (PP$ = "TIME") THEN
    S = 41 - 20 - C: PP$ = ""
730 IF (C$ = CHR$(13)) THEN
    PRINT SPC(S);: GOTO 780
735 IF ((ASC(C$) < FC) OR
    (ASC(C$) > LC)
    AND (C$ < > CHR$(08)))
    THEN C = C - 1: GOTO 705
740 IF (C$ = CHR$(08)) AND
    (C = 1)
    THEN PRINT ;: GOTO 690
745 PRINT C$
750 IF (C$ = CHR$(08)) AND
    (C = 2)
    THEN PRINT ;: GOTO 690
755 IF (C$ = CHR$(08)) AND
    (C > 2) THEN C = C - 2:
    T$ = LEFT$(T$,C): GOTO 705
760 IF (C = LN) AND
    (OP$ < > "WRAP")
    THEN T$ = T$ + C$:
    GOTO 780
765 IF ((C = > LN) AND
    (C$ = ""))
    THEN PRINT SPC(S - 1):
    GOTO 780
770 IF ((C > LN) AND
    (C$ < > ""))
    THEN T$ = T$ + C$:
    GOSUB 790: GOTO 780
775 T$ = T$ + C$: GOTO 705
780 OP$ = ""
785 RETURN
```

GET LINE has to make sure that the number of characters entered doesn’t exceed the expected line size, LN. To do this, I made the routine count each character as it was accepted. Afterward, GET command the character count C was compared to LN. If the maximum length was reached, control would be returned to the calling routine. This can be seen in lines 690, 705, 760 and 775.

The screening process

The next step was to screen out unwanted characters and to specially treat specific characters like backspace and ESC. It is important to de-

ASCII CODES

Every character on the keyboard has a corresponding numeric code. This is often called an ASCII code. ASCII stands for American Standard Code for Information Interchange. ASCII codes are useful when you want to represent a weird character in a program like RETURN, ESC, CTRL-Q, etc. To find the ASCII code of a character, you use the ASC () function: For example, say the ASCII code for "C" is 58. A = ASC("C") would give A the value of 58. Conversely, CHR\$() returns the character corresponding to an ASCII code. A\$ = CHR\$(58) would place the letter "C" in A\$.

At the beginning of my program, I assigned any weird characters that I might use to string names. Rather than say CHR\$(27) when I want ESC, for example, I would say ES\$ since at the beginning of my program I did ES\$ = CHR\$(27). Likewise, the return key could be represented by RES = CHR\$(13).

Another advantage of ASCII codes is that they make it possible for the computer to compare the order of certain characters. For example, since "A" has an ASCII value lower than "B," "B" is considered to be greater than "A." Thus, in a relational expression, "SUNDAHL, JOHN" is greater than "MIMAN, OTIS."

In the Desk Master program, the GET LINE routine makes sure that any input character is within the range of FC to LC. If FC is 56 and LC is 95, then all characters must be alphabetic. If not, they are ignored. Computer users’ manuals have tables of ASCII values, usually in their appendices. Here are some of the common character constants used in Desk Master:

```
ES$ = (ESC)
BK$ = (BREAK)
RE$ = (RETURN)
BS$ = (BACK SPACE)
NUS$ = "" (null or empty string)
```


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test the ESC key first, since if it is encountered, a flag is set and control is returned to the main program.

Unlike INPUT, the GET command does not echo its input. When the computer accepts your character with the GET command, that character is not displayed. But here a backspace or valid character must be echoed to the screen so the user can see what's going on. This is done in line 745.

Line 755 decrements the counter by 2 if a backspace is entered. One count is subtracted for the backspace, and one is subtracted for the deleted character. The LEFT\$ function is used to extract the deleted character.

As soon as I had completed these tasks, I was confronted with the problem of word wrapping. I saw that if I had a word overhanging the right margin, LN, I would need to call a routine that would extract the word from T\$, erase it from the screen and place it in a variable, WW\$, which would be used later. If GET LINE were called again, as would be the case with INPUT TEXT, the beginning of the saved word could be inserted into T\$, and the character counter could be advanced by the length of the word fragment. Here's the WORD WRAP subroutine.

```
790 REM **** WORD WRAP ****
795 REM IMPORT T$, LN
800 REM EXPORT T$, WW$
805 REM
810 LN=LN+1
815 C=LN: WW$=""
820 C=C-1: C$=MID$(T$,C,1)
825 IF (C$=" ") THEN
    WW$=RIGHT$
    (T$,LN-C):T$=LEFT$(T$,C):
    HTAB 1: PRINT M$:T$:
    GOTO 845
830 IF (C>1) THEN GOTO 820
835 WW$=""
840 IF (LEN(T$)=>LN) THEN
    T$=LEFT$(T$,LN): PRINT
845 RETURN
850 REM *****
```

WORD WRAP counts backward from the end of T\$,LN, looking for a

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PARAMETERS AND FLAGS

A subroutine can do different things, depending on the value of certain variables when control is transferred to the subroutine. For example, the GET LINE routine uses the variables FC and LC to check the validity of a character. FC is the ASCII code of the first acceptable character and LC the last. If the ASCII value of the given character is between FC and LC, as shown in the GET LINE flow chart, then the character is accepted.

Depending on how FC and LC are set when the GET LINE routine is called, different character groups will be expected—alphabetic, numeric, or both. Values passed into a routine for its reference are known as parameters.

A flag is a variable that has one of two values. For instance, the GET LINE routine sets EC\$ to ESC if the ESC key is detected. If not, EC\$ remains blank or equal to NUS (see character codes). Unlike a parameter, which can take on a whole range of values, a flag can only have two. Thus a flag is analogous to a binary digit (which is the same as a bit). This binary digit can be only yes or no, but nothing in between.

In some programming languages, notably FORTRAN, there is a variable type called LOGICAL. BASIC has only real and integer numbers, and characters. Logical variables are assigned only one bit position in FORTRAN, and hence really can take only two values, 1 and 0. In Desk Master, I had to use variables that could be assigned any value up to the maximum permissible. This isn't a problem, really, as long as I take care not to assign values other than the right ones to my flags. If memory space were a problem, I would use integer variables as flags, since they take up less memory space.

blank. When the blank is found, in line 825, then we know we found the beginning of the word. At this point the RIGHTS function is used to put the word fragment into WW\$, which will be passed back to GET LINE. The LEFT\$ function cuts it off the input line so that line is no longer than LN. At this point I thought that WORD WRAP was cleverly done, but I had forgotten to wipe the word fragments off the screen. I added the rest of line 825 to take care of that. MAS\$ is the number margin in case the line is numbered (see the Number-Indent flow chart on page 134). Line 840 takes care of the situation when a word takes the whole line and, thus, no space would be found.

I also decided the string array L\$() could be used whenever a text buffer was needed, for appointments and cards in the index file, for example. I chose the length of this buffer as 50 lines with the constant BS in the beginning of the program. You can change this length, but I figured 50 lines was about all that a user could keep track of without page-control routines. (Otherwise, the screen would always be filling up before the user could get a chance to read his document.) I knew, too, that if the buffer got too big the program could run out of memory and abort. And, since I expected memo-size documents, 50 lines seemed like enough. You certainly have the option of expanding the buffer and adding page control routines that stop the screen whenever it fills up with information. Page control should occur in the PUT TEXT routine which displays the text buffer (page 138).

Easy user-interaction is a tough programming problem. I had to ask myself how I could make it possible to change text in a common-sense way for the user that was efficient of computer resources. The simplest scheme that I could think of goes as follows. First the buffer is displayed on the screen with each line numbered. Then the program displays a

choice of options like this:

Change (C), Insert (I), Delete (D), or Append (A)?

I made this menu horizontal so it could be displayed with the text buffer. Once an option is chosen, the appropriate correcting routine is called. These routines request a line number and accept the change. All the change routines simply input new values and place them in the buffer. For example, the CHANGE LINE routine displays:

Line number to change? —

It uses a routine called GET VALUES which uses GET LINE to read the line number (explained in an upcoming article on the appointment calendar article) into L, redisplay the line to be changed:

PRINT L\$(L)

reads the new line with GET LINE, and does the replacement:

L\$(L)=T\$

since T\$ is always provided by GET LINE.

The insert and delete routines are similar, but they must push other lines in the buffer forward or backward to accommodate a new line or cover an old one. I accomplished this with a loop where L\$(N)=L\$(N-1) or L\$(N)=L\$(N+1) (see Delete Line on page 138).

The routine that prints the buffer on the printer was the easiest routine to write. It simply involved turning on the printer (which is done differently on every computer, so consult your program or manual), calling PUT TEXT (shown in the flow chart on page 138), and then turning the printer off.

Further articles about Desk Master will explain the process behind the programming of the appointment calendar and the calculator. But, in the meantime, if you have any questions about the portions of the program I've explained so far, send them to me, Leon Starr, in care of *Personal Computing*, 50 Essex St. Rochelle Park, NJ 07662. I'll try to get answers to you.



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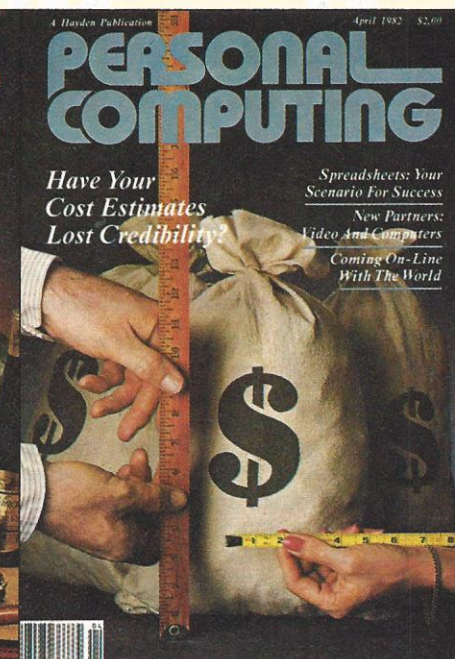
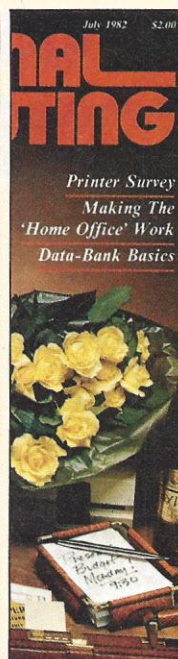
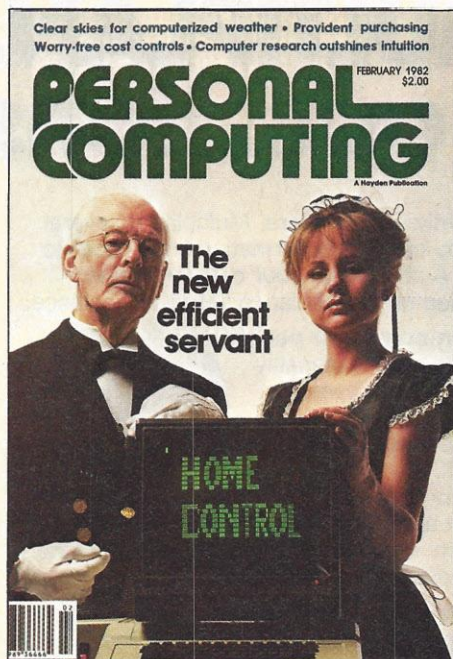
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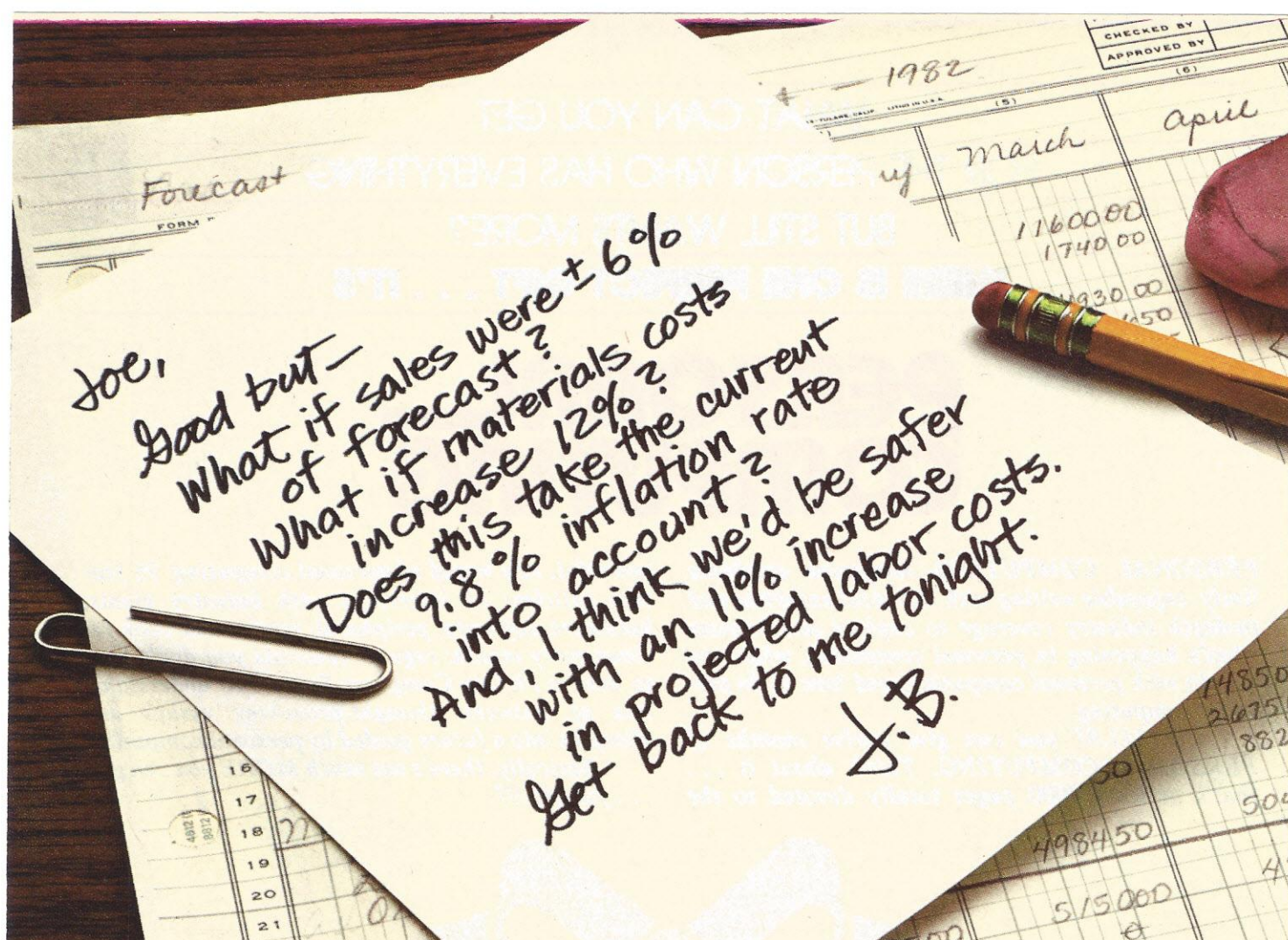
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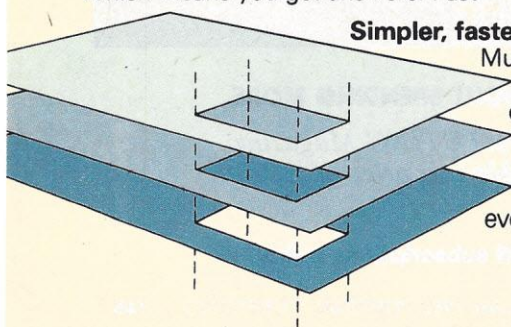
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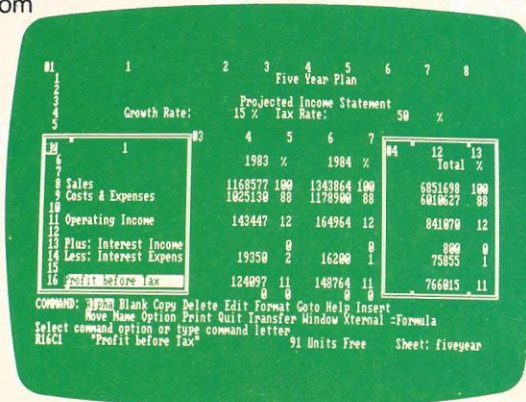
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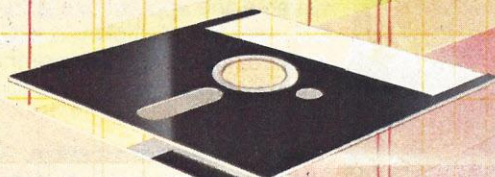
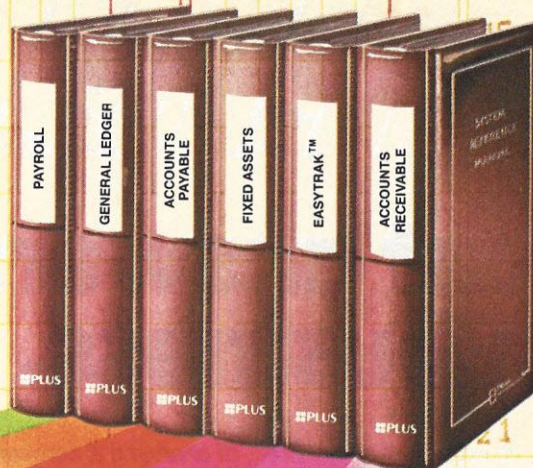
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by Roy Katz

BASIC FOR BUSINESS

DOUGLAS HERGERT
SYBEX BOOKS
BERKELEY, CA
223 pp., \$12.95

SCIENCE AND ENGINEERING SOURCEBOOK

CASS LEWART
MICRO TEX PUBLICATIONS
NEW YORK, NY
91 pp., \$9.95

These two programming guides approach the subject from different perspectives. In the *Science and Engineering Sourcebook*, Cass Lewart, a professional communications engineer, provides 25 actual programs that can be run on the new pocket computers. In *BASIC for Business*, Douglas Hergert walks the reader through several practical business

programs as he explains why and how they work.

Science and Engineering Sourcebook is designed to help engineers, analysts, mathematicians and anyone else who makes extensive use of complex formulas on a regular basis. Its 25 programs cover formulas in electrical engineering, queuing theory, reliability, curve-fitting, statistics, graphic generation, number theory, computer science, artificial intelligence and related technical areas. These programs were specifically written to run on TRS-80 and Sharp PC-1211 pocket computers; however, the book has an appendix with information necessary to convert these programs to run on other computers that use BASIC.

The programs that many pocket-computer owners will find especially useful are the Decimal to Binary Fractions and the two User Checking

Account programs. The Decimal to Binary Fractions program, Lewart explains, will "accommodate both the 'decimal' and the 'binary' world population; this program will translate a decimal fraction into its binary equivalent." The Checking Account program enables users to easily balance two separate checkbooks against the monthly bank statement.

BASIC for Business is written for the businessperson who wants to know how and why programs work. It approaches the study of BASIC from the businessperson's perspective; that is, it guides the reader through the development of several practical business programs, including a cost of goods sold inventory program, break-even point analysis, T-ledger accounts, depreciation and basic statistical analysis programs.

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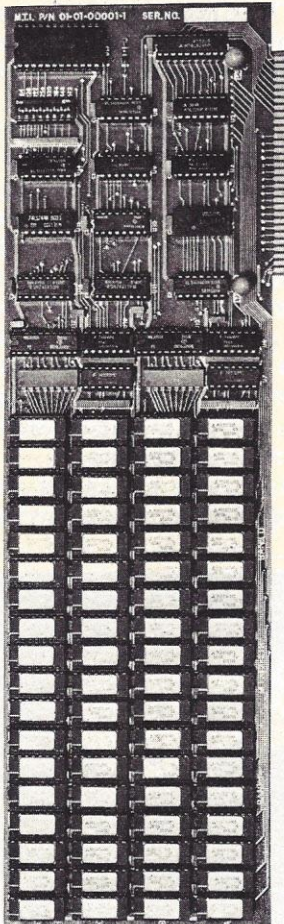
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CIRCLE 64

BOOK REVIEWS

often confusing concepts in each chapter, Douglas Hergert avoids this problem by concentrating on only one syntactical feature of BASIC per chapter, fully explaining its use with easily understood illustrations. For example, in discussing the debugging of BASIC programs the author writes: "Programming bugs come in two varieties—syntactical and logical. A syntactical bug is a misuse of the programming language itself—misspelling a reserved word, punctuating incorrectly, or failure to adhere perfectly to the strict grammar of the programming language." And on logical bugs, the author says: "Generally such bugs appear in exactly the routines that the programmer was certain were perfect. Because most logical bugs are completely unexpected, half of the task of correcting them may simply lie in locating them in the program." What could be easier to understand?

While *BASIC for Business* concentrates on the effective use of BASIC in business programs, it also has brief explanations of the important differences between BASIC and other languages such as FORTRAN and COBOL. In addition, Hergert has written a series of comprehensive review questions at the end of each chapter, designed to test and sharpen the reader's understanding of important concepts.

Get the upper hand on your Apple

APPLE II USER'S GUIDE

LON POOLE, MARTIN MCNIFF &
STEVEN COOK
OSBORNE/MCGRAW-HILL
HAYWARD, CA
385 pp., \$15

Before powering up your Apple II, reach for a copy of the *Apple II User's Guide*. Lon Poole, Martin

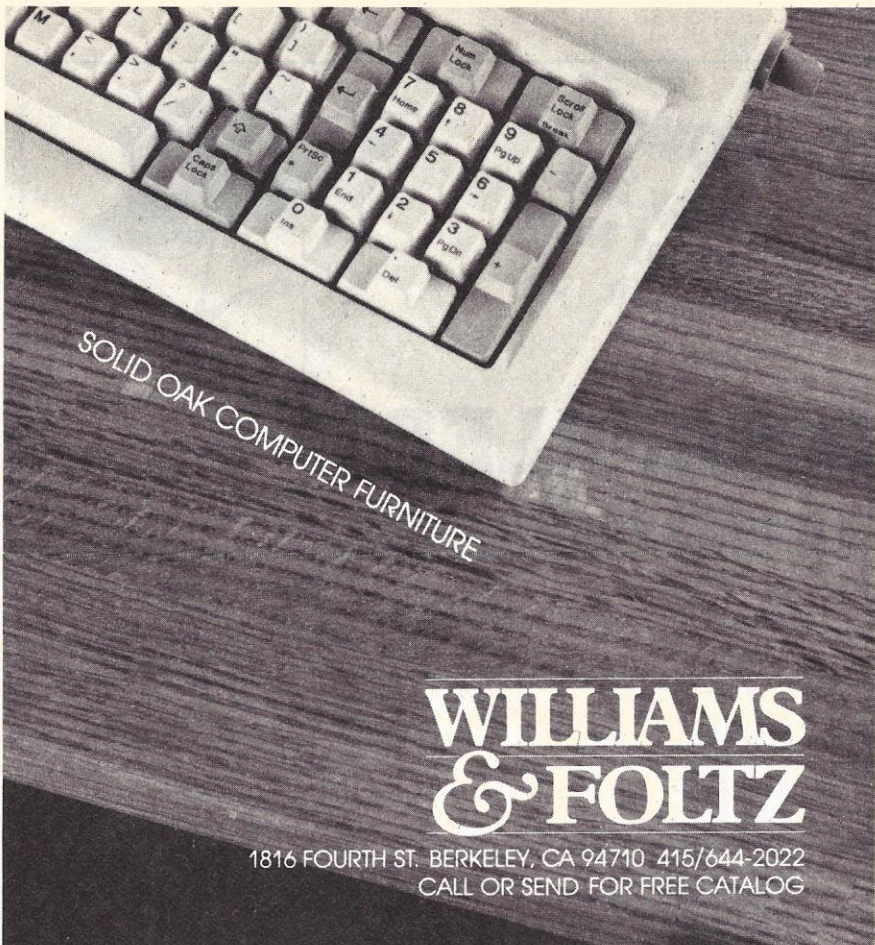
McNiff and Steven Cook have written an exhaustive hands-on resource book—must reading for every Apple II owner. Like the authors' companion volume, *Your Atari Computer*, the *Apple II User's Guide* shows readers how to make their Apples operate at peak efficiency, and what to do when things go wrong.

The book is designed to help readers avoid and overcome problems that arise when using Apples. For example, the authors maintain that sooner or later everyone accidentally presses the Reset key, causing the system to crash. The book then offers two simple suggestions for making it harder for this to happen: First, simply remove the plastic keytop which leaves only the keyshaft exposed; and second, remove the keytop, but insert a 3/8-inch washer around the keyshaft flange and replace the keytop. The authors say this washer makes the Reset key harder to press; therefore, it allows for fewer accidental resets.

"The Apple II is a marvelous piece of equipment," the authors write, "but it shares a problem common to all computers—it lacks imagination." The *User's Guide* thus devotes four extensive chapters to all areas of BASIC programming, both introductory and advanced, in the hope that readers will supply this missing ingredient.

In presenting their study of BASIC, the authors concentrate on how the rules of BASIC are combined and used to write practical programs. The *Apple II User's Guide* focuses on clean programming and operating procedures through simple common-sense rules. One rule, for instance, is to always use plenty of program remarks; another is to enter whole functional blocks of data and then process them, rather than processing line by line.

The chapters on using disk drives and Machine Language Monitors are among the best. Although highly technical, the authors explain everything with ease and clarity. Poole,



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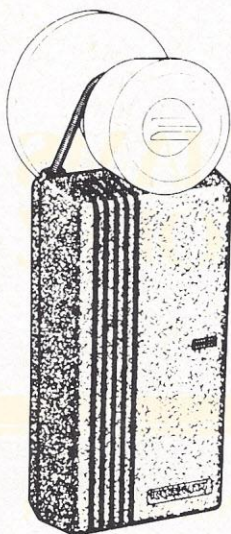
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BOOK REVIEWS

McNiff and Cook have written a book that can be easily understood by the beginner, yet it is also filled with the technical information experienced users require. While it is difficult to be all things to all readers, the authors manage to pull this off effortlessly—this makes for a solid, highly readable volume.

Small machines that shrink office overload

HOW TO PROFIT FROM YOUR PERSONAL COMPUTER

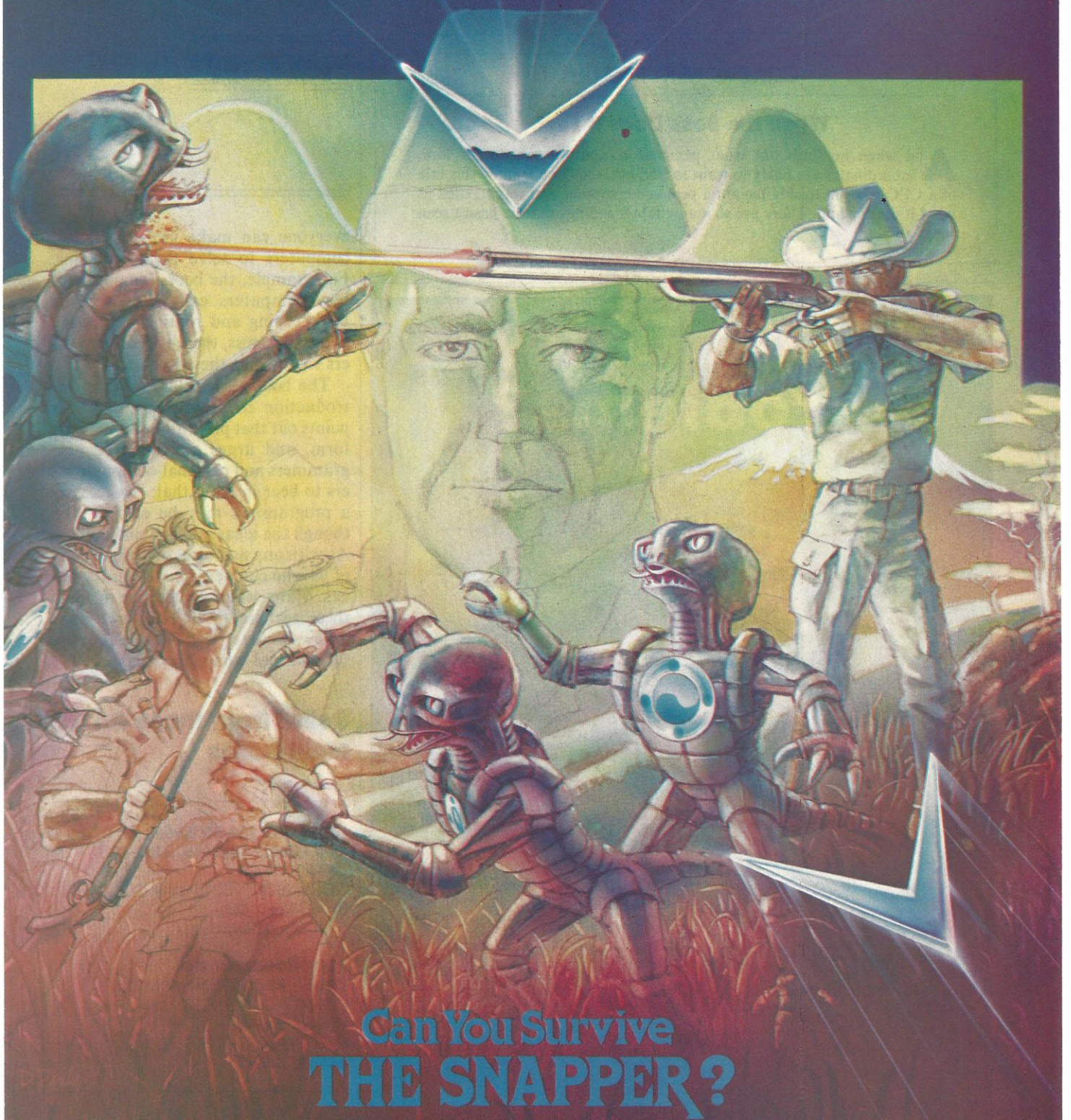
T.G. LEWIS
HAYDEN BOOK COMPANY
ROCHELLE PARK, NJ
192 pp., \$11.75

Here is a little book that provides the non-technical reader with a solid foundation in the use of personal computers in small businesses or professional practices. Ted Lewis cuts through the technical computer jargon, and writes an informative book which explains what the systems can, and cannot do, and what first-time buyers need to know about the machines before they buy.

How to Profit from Your Personal Computer describes several common business problems, showing how they can easily be solved with personal computers. Lewis sums up these problems in his business "Rules of Expansion." They include: "Inventory expands to fill the warehouse. Mail expands to fill the post office. Patients expand to fill the clinic. And pocket calculators expand to fill the office."

The author also provides some case histories of businessmen who overcame these and similar problems using their personal computers.

According to Lewis we are in "the age of common computing" in which



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BOOK REVIEWS

everyone can make use of personal computers to solve their problems. For example, the book demonstrates how computers can take over the bookkeeping and routine paperwork of any business, thereby freeing owners to do what they do best.

The book also includes a brief introduction to programming. Lewis points out that programming is an art form, and urges all would-be programmers and personal-computer users to bear in mind that: "Success as a programmer may be elusive even though the ideas are well understood. As with any art form, there are many of us who can never be one of its artists. Many others will be able to apply these techniques to their own situations, however, and become successful personal-computer owners."

Relief from those BASIC nightmares

LEARNING TRS-80 BASIC FOR MODELS I,II/16, AND III

DAVID A. LIEN
COMPUSOFT PUBLISHING CO.
SAN DIEGO, CA
544 pp., \$19.95

PROGRAMMING THE TRS-80 POCKET COMPUTER

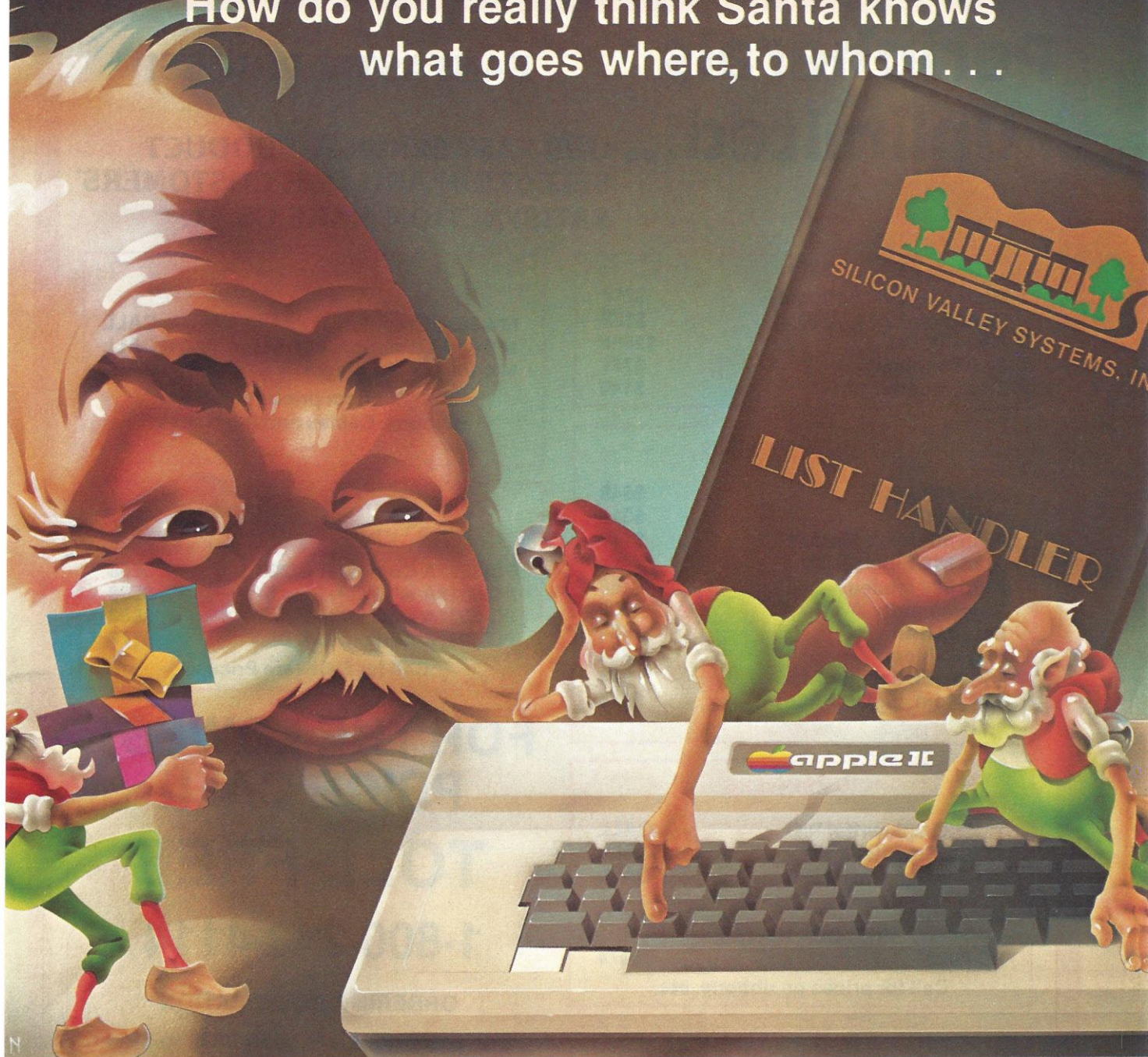
DONALD D. SPENCER
PRENTICE HALL
ENGLEWOOD CLIFFS, NJ
544 pp., \$8.50

Studying BASIC or any computer language can be a boring task; David Lien has turned it into a pleasing and significant experience. His breezy style enables him to get his message across with a smile—"Aha! That's an interesting point, I'll have to remember that."—and impact.

Each chapter is tutorial, and concentrates on one concept, which allows the reader to completely master

CIRCLE 60

How do you really think Santa knows
what goes where, to whom . . .



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BOOK REVIEWS

any subject before proceeding. At the end of most chapters there are practical exercises and questions, each designed to reinforce the chapter's main points.

The author maintains a snappy dialogue with his readers as he explains, questions, repeats, and even sets up his unsuspecting and trustworthy readers to err, all in the name of explaining the finer points of BASIC as it applies to TRS-80s. Lien uses crisp, powerful prose to explain BASIC terms when he says, "Integer??? I can't even pronounce it, let alone understand it! Oh, come. Don't let old nightmares of being trapped in algebra class stop you now. It's pronounced in-teh-jur, and simply means a whole number like 5,

0 or 3. How difficult can that be? Come to think of it, some folks make a whole career of complicating simple ideas. We're here to do just the opposite."

And indeed he does. Lien takes beginners through 50 elaborate tutorials covering all areas of BASIC—how it works, and how to write programs with it for the TRS-80. The material is not only presented with the right touch of humor, but more important, it is well written. Readers with no computer background will be able to understand the book easily.

Likewise, Donald Spencer's *Programming the TRS-80 Pocket Computer* is written for the novice computer-user. The book is an easy to use how-to guide that takes readers

step by step through pocket-computer programming.

Spencer points out the TRS-80 Pocket computer is only the first of many models of pocket computers which, in the near future, will become as commonplace as pocket calculators are now. He maintains that pocket computers enable business executives and managers to make the most effective use of their business savvy—they can test several alternatives before choosing one strategy.

Spencer also mentions another, if unconventional, use of pocket computers: gambling. He argues that pocket computers should be mandatory equipment for professional gamblers because the machines can maximize (results not guaranteed) bet-

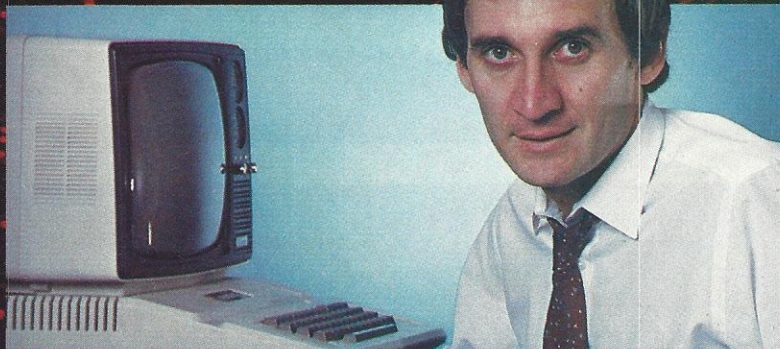
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ting strategies by displaying odds at the track or other statistical information. On a more conventional level, however, the author writes that pocket computers enable engineers to solve sophisticated problems on the job site by simply entering in the proper numbers.

In *Programming the TRS-80 Pocket Computer*, Spencer describes how the machine works, the functions of its keys, and provides examples of the TRS-80 PC in operation. He keeps his examples practical and simple as he discusses the BASIC programming needed to run the computer. The book also contains large drawings of the TRS-80's display which shows various stages of almost every problem.

Unclouding the operating system confusion

INSIDE CP/M—A GUIDE FOR USERS AND PROGRAMMERS WITH CP/M86 AND MP/M2

DAVID CORTESI
HOLT, RINEHART AND WINSTON
NEW YORK, NY
570 pp., \$22.95

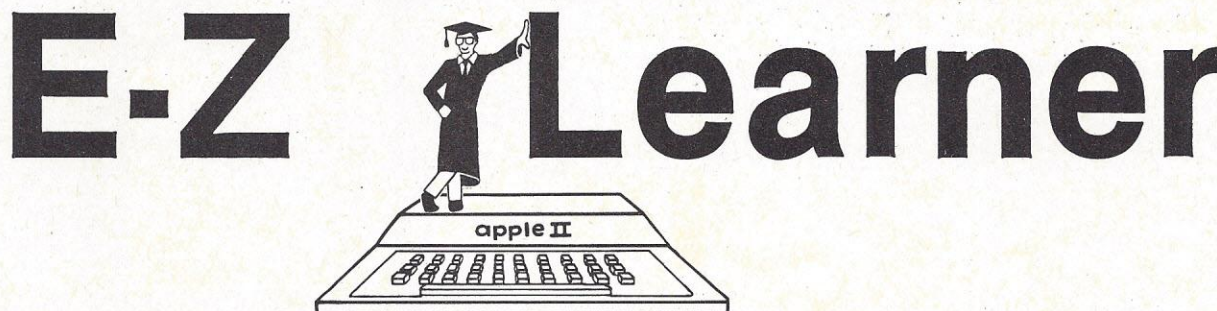
David Cortesi's detailed, understandable book is designed for the experienced computer programmer and user, as well as the novice. *Inside CP/M* is a combination

textbook and cookbook that examines the building blocks of personal computers—their hardware, software and how they use the CP/M operating systems. It is also a fact-filled reference book that answers complex questions about the special operations of CP/M.

Despite its title, *Inside CP/M—A Guide for Users and Programmers*, the book will not teach readers how to program; instead, it details the use of the CP/M operating system as an integral part of a computer system. Specifically, the book stresses how CP/M works, what it can and cannot do and, most important, how readers can avoid or correct errors and problems.

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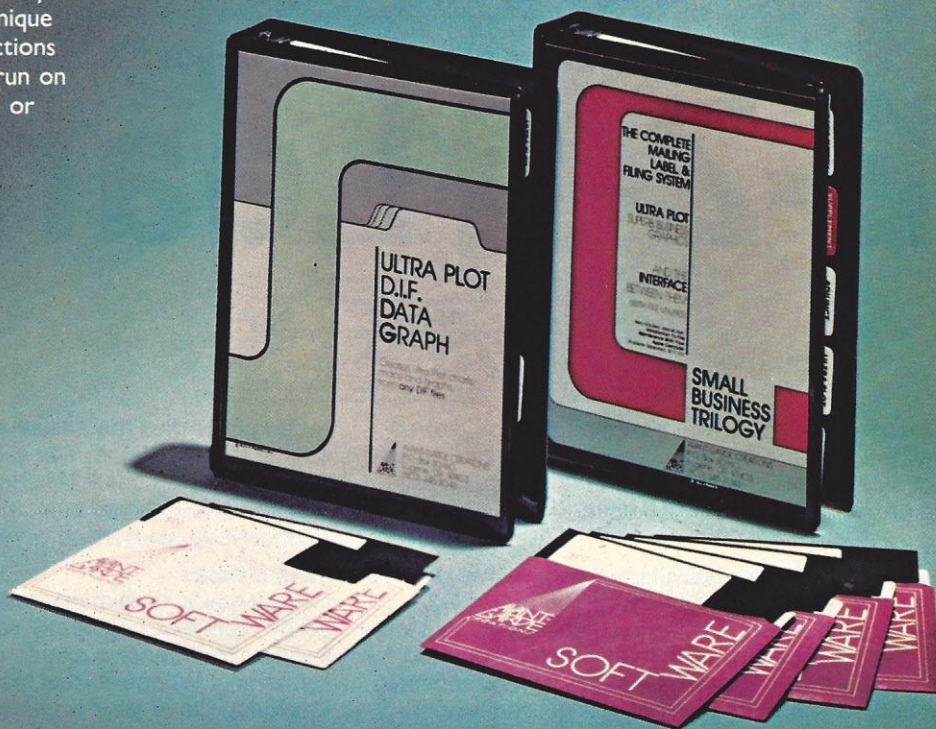
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BOOK REVIEWS

style of a professional who thoroughly understands his subject and the innermost workings of the minds of programmers for whom he writes: "Programming is both an intellectual challenge and an act of personal domination over the machine. However, programmers, like bureaucrats, are always subject to the temptation to confuse means with ends. In their fascination with the intricate puzzle of machine and language, they are apt to forget the people who will actually use the program."

While the entire book will interest programmers and users, its second half alone is well worth the price of the book. It is designed to meet the needs of programmers and users on a daily basis, with page tabs that allow

for almost instant access to any subject. It lists the CP/M commands and functions in alphabetical order, describing the syntax and operations of each.

Unveiling the secrets of the personal computer

AN INTRODUCTION TO MICROCOMPUTERS—VOLUME O, THE BEGINNER'S BOOK

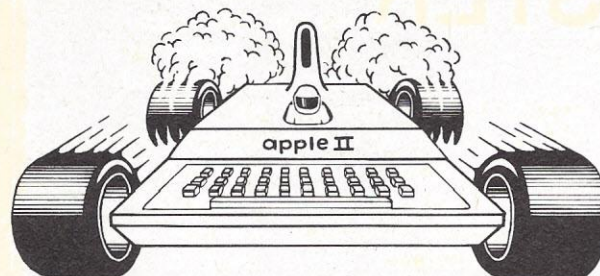
ADAM OSBORNE AND DAVID BUNNELL
OSBORNE/MCGRAW HILL
233 pp., \$12.95

An *Introduction to Microcomputers* is one of those rare

introductory books that will interest junior high-school students, college professors and business executives alike. The authors present their material clearly and accurately, and provide dozens of diagrams that superbly complement and amplify the brilliant text. In short, Adam Osborne and David Bunnell have written an outstanding and informative book.

The book concentrates on the practical information that beginners need to know before using or purchasing personal computers. It explains the various components and functions of these machines, including peripherals, printers and disk drives. *An Introduction to Microcomputers* also includes an extensive primer on

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BOOK REVIEWS

programming, binary numbers, logic operators and the technical principles behind personal-computer operations.

In addition, the authors have included a detailed chapter on how to choose the right personal computer for the reader's needs, and sum it up with this advice: "Before you buy microcomputer, you must know exactly what you want it to do both now and in the future. Then shop for machine that will accomplish the tasks you need."

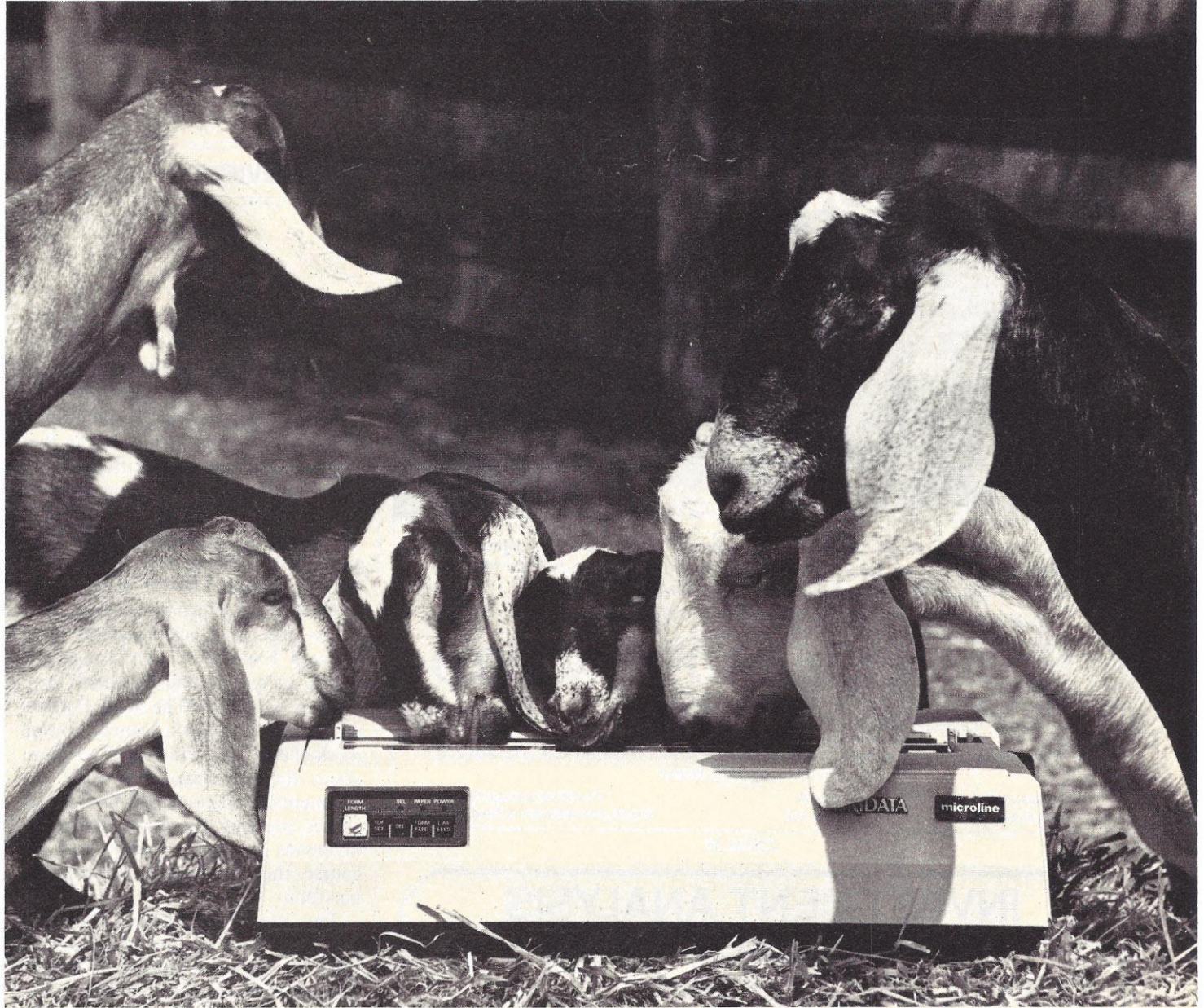
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HAYWARD, CA
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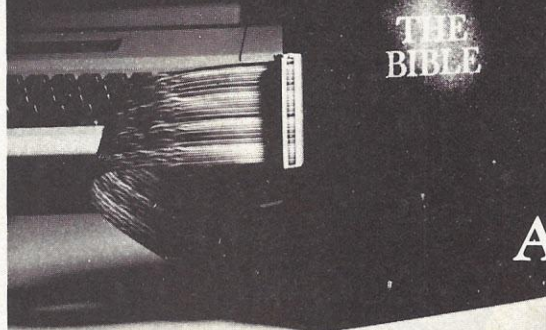
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BOOK REVIEWS

several personal computers including the Apple, the TRS-80, the IBM PC, and the Commodore PET and CBM. In most cases readers just key in the programs as they are written in the book, substituting their own data in place of the sample data. The book also includes a printout of each program, highlighting the values that must be provided by the user.

Among the most interesting programs are the Stock Portfolio, The Planned Expense Analysis, and the Home Inventory and Personal Possessions Evaluator. The Stock Portfolio program enables investors to keep track of everything they need to know about the performance of their investments. It monitors the number of shares, purchase price, current price, dividends per share, yields, and, of course, the total market value of the portfolio.


The Planned Expense Analysis program will interest managers who need to compare month-to-month changes in the expenses of their various departments. It calculates the differences between each month's planned and actual expenses, showing both the dollar and percentage changes in the actual expenses from month to month.

The Home Inventory and Personal Possessions Evaluator is one of several programs designed for home financial use. It is used to itemize and evaluate personal possessions (such as your personal computer) for insurance coverage, and it evaluates claims for losses due to fire or theft. The program lists each item's original cost, resale value according to straight line depreciation, and the replacement value based on the local inflation rate.

The *VisiCalc Home and Office Companion* is easy to use, and its programs will interest most people who have or use personal computers for business purposes. The programs are well-written, making the book a worthwhile addition to the reader's personal computer library. 

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by Thomas Throop

Ever wish you could practice your poker skills before the weekly poker night? Ever want to bet the house limit without losing your shirt in the process? Now you can satisfy your card playing urges with Dynacomp's (Rochester, N.Y.) Poker Party—and you don't have to clean up the cigar butts and beer cans when the game is over.

This program is actually a computer simulation of a seven-player draw-poker game. You are the primary player and the computer represents the other six people. The objective of this game is the same as in an actual poker game—to win all of the money. The computer players know only the information which would be available to each player in an actual game. Most of the players play quite well, usually betting according to a table of odds, but with variations in degrees of bluffing.

The card deck contains the standard 52 cards plus a joker called the "bug." The joker may be used as a restricted wild card which you define at the beginning of the game, as an ace, or to fill out a straight or a flush. The joker could thus be used with two pairs to create a full house if and only if one of the pairs consists of aces.

Each player starts with \$100 worth of chips. The ante for each deal begins at \$1 and increases \$1 with each deal for which no one opens. The basic bet and each raise is \$5 before the draw, and these are increased by \$1 with each deal for which no one opens. After the draw, the basic bet and amount of each raise are doubled. Three rounds of betting are permitted before the draw and three after the draw. Occasionally, the house will debit a player \$2 for pretzels and beer.


In the three games I played with the program my six opponents were Joyce, Oscar, Ruth, John, Bev and Kathy. In the first game Bev was the first to lose all of her money, followed by Joyce. When one of your opponents runs out of money, he leaves the game. When

you run out of money, the game is over and the program must be restarted to play another game. After 27 hands, I, too, lost all of my money and the program said, "Thanks for coming over, Tom."

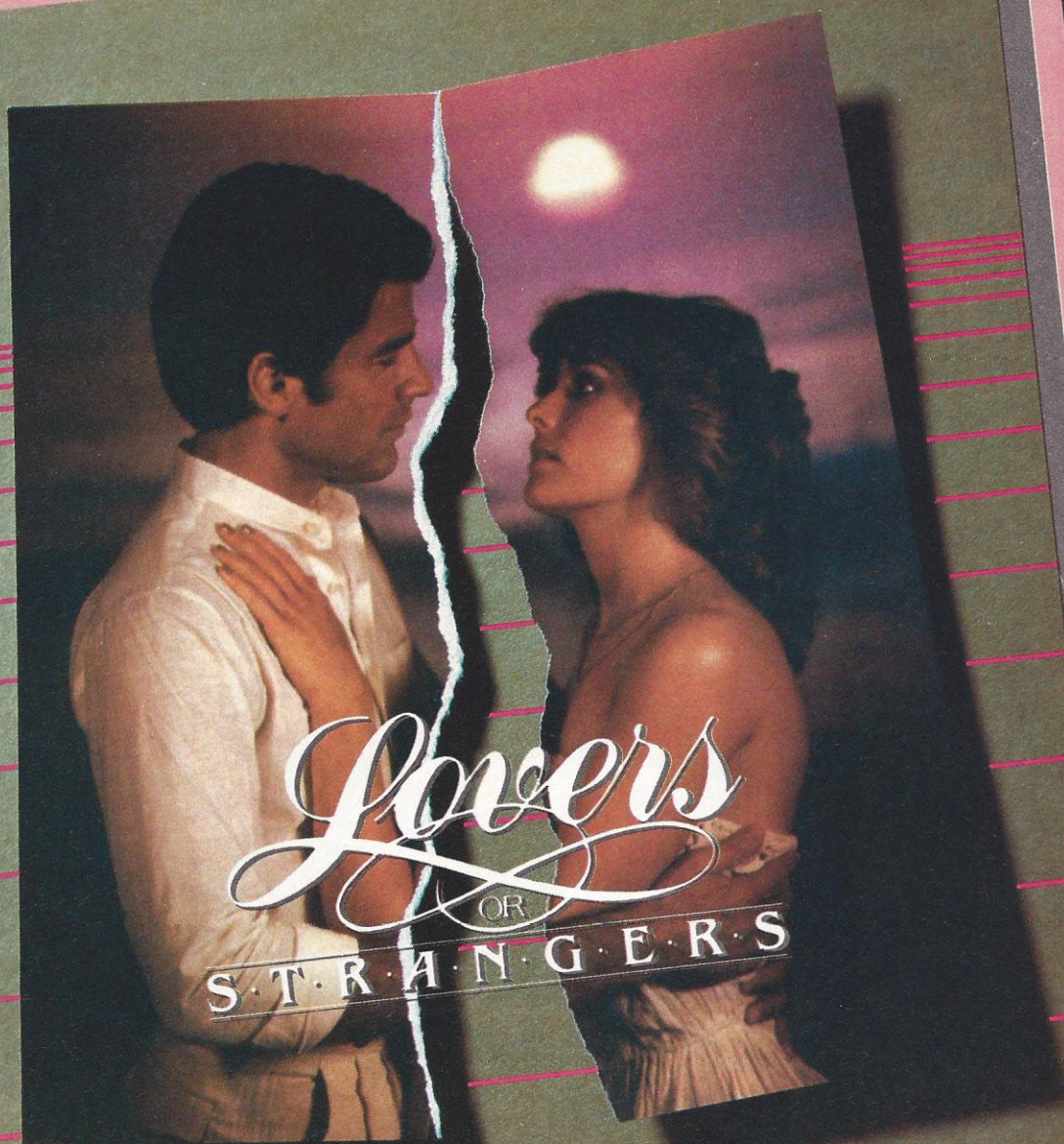
In the second game I was \$94 ahead after 15 hands when I hit a key that the program did not understand; this ended the game. There appears to be no restart procedure to continue the same game if you encounter a keyboard-entry problem, and the program's documentation mentions no such restart procedure.

After the third game I was beginning to draw certain conclusions about the ability and betting tendencies of the specific players, just as you would in an actual poker game. After a few hands I based my betting partially on which opponents were still playing any particular hand. Thus, the player is confronted with a realistic learning situation, which I think makes the product most interesting. I think the game could have been made even more interesting, however, if the betting amounts were not fixed, but rather allowed to be, for instance, \$5, \$10 or \$20 when the basic bet is \$5.

The program, at least for the TRS-80 Microcomputer Model I, has some other weaknesses which detract from the play. First, sometimes an opponent's hand will scroll off the screen after you "call" him. Second, you are not shown your drawn cards until you have made your bet. If you were shown them immediately, you could be thinking of your betting strategy while the other players are betting. Third, a poker "call" (when you decide to bet an amount equal to the last bet) is termed "sticking," which is a word used in the game of blackjack. Fourth, it would be helpful to know the size of the pot at all times during the betting, and have the program sort your cards by suit and rank.

Poker Party runs on Apple, Atari, North Star, Commodore and Radio Shack personal computers. For most machines, the product requires 16k of memory, but the Apple version requires 32k and the Atari version 24k. The price for the cassette program is \$19.95; the disk program is \$23.95. 

Maryland-based Thomas Throop is a free-lance games writer who has been working with computers since the days of the Univac 1.



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LETTERS

(continued from page 8)

a classroom teacher and administrator behind me, I found the article by David Grady, "A Hard Look at the World of Educational Computing" on page 40 of the August issue, most intriguing. I, in turn, would like to take a "hard look" at the major points made by Mr. Grady in that article.

Mr. Grady asserts that the real crisis facing schools is not a software shortfall but a hardware crunch, accompanied by a misconception about how computers can help children learn. I must object, first, to his identification of the "real crisis." There is a crisis, but it has nothing to do with software shortfalls or hardware crunches. Rather, it stems from a present and growing lack of public confidence in the effectiveness of our public schools. Falling test scores on one hand, and an apparent growing disciplinary disorder on the other, are frequently cited in the media as the cause of failing public confidence. The result, as Mr. Grady indicates, is a rapid reduction in financial support for schools. No doubt the faltering economy has a great deal to do with this, but lack of public support for schools has made cutting school budgets a popular political activity.

Is it possible to employ personal computers to assist schools in overcoming this negative image? I am convinced that the answer is an emphatic yes! In explaining this answer, however, I must return to another assertion of Mr. Grady's that there is a misconception (presumably on the part of schools and teachers) as to how computers can help children learn. The misconception, I submit, is not harbored by schools and teachers, but by people who advocate the use of computers in schools, in accordance with the description provided by Mr. Grady.

As I understand it, Mr. Grady's recommendation is that schools be flooded with personal computers so that, presumably, each child will have an almost unlimited opportunity to explore the world which lies behind the keyboard, with the probable result that each will ultimately discover for himself the knowledge and skills for which schools are responsible. If Mr. Grady has followed in detail, as I have done, the innovations of the '60s and early '70s, most of which attempted to achieve

(continued on page 172)



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LETTERS

(continued from page 169)

somewhat similar results using teacher-independent methods, he knows that virtually all of them have been abandoned. Why? As soon as the special support that attended their pilot phases was dropped, falling test scores or other negative results dictated their being phased out.

If the personal computer is to make a significant contribution to school effectiveness, it must be conceived of not as a substitute teacher, but as an aid to the teacher in managing instruction. It can also be used (and is now being used) in providing enrichment for more advanced students and as a tutor for those who tend to lag behind. But its most effective use will be as a management tool, providing the teacher with immediate access to a broad student data base, as a means for rapidly assessing student progress, and in using these data to plan instruction. It may also be usefully employed in tandem with a video disk or cassette recorder in making more effective presentations and in guiding skills development.

Note, please, that none of the uses identified above is based on the assumption that every child need address the keyboard on a regular basis. Nor is the computer viewed as a primary tool of direct instruction. Such an assumption is not likely to prove viable due to a lack of school funds and is, in my opinion, counterproductive to the essential role of the teacher in leading instruction.

Charles M. Proctor, Jr.
SILVER SPRING, MD

Your recent article on educational computing (on page 40 of the August 1982 issue), was an interesting view of the current problems with introducing computers into the American school system. Unfortunately, I feel that many other severe problems were left unquestioned.

The most significant problem facing educators trying to incorporate computers into the school system is diminishing educational budgets. With available funds shrinking at every turn, schools will be hard pressed to improve much beyond the current minimal computerization described by the article.

The American public school system, for all its good intent, is reaching or has reached a limit of sorts. It can barely afford to supply the necessary books for

current learning procedures, and in many different fields, these books can be reused for years and years. This is quite a different situation from that of almost any broad implementation of computers. The cost of purchasing the quantity of computers necessary to produce a computer-literate next generation is astronomical. Furthermore, this cost cannot be amortized as with traditional learning materials, due to the pace of improvements within the computing fields.

Consequently, I must reach the unfortunate conclusion that there is little hope for the future of public education. If "computer literacy" or "computing" is to become as essential as reading, writing and arithmetic, then the privately owned, usually better funded schools will provide a noticeably better learning alternative to the public school system. If enough of the middle- and upper-class families remove their children from the public school system, it is not unthinkable that they will then demand the right to be exempt from school taxation. This will not help the plight of the public schools either. Also, this will further polarize the race and class differences, and coupled with the influx of robotics, create a new, large group of unemployables.

I realize that this may portend a dismal future, but unless these questions are resolved, I foresee no other conclusion.

Gil Kettles
BERKELEY, CA

David Grady's article, "A Hard Look at the World of Educational Computing," on page 40 of the August 1982 issue, hit the nail on the head with a sledgehammer. The accompanying illustration which shows a long line of kids (24 to be exact) waiting to use a single personal computer is worth the proverbial thousand words.

It was looking at lines of kids like those in the illustration, or worse yet, kids who are totally excluded from computer use because they are not "gifted," that led my wife and I to move from public school teaching to private education. We now head the Kids Computer Connection, a users group for youngsters that has a heavy emphasis on programming. We feel that the "genuine computer literacy" Grady talks about should be provided through public schools, but we don't see that happening.

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LETTERS

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Jim Tartaglia

DIRECTOR

KIDS COMPUTER CONNECTION
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ON THE DEVELOPMENT OF PROPERTY-MANAGEMENT PROGRAMS

I am writing in regard to the article by Margo Downing-Faircloth, "Personal Computing Pays Off for Property Managers," on page 55 of your June issue. My company's software package, The Landlord, is mentioned in the article.

Although the article was good, it gives an incorrect impression concerning available products. Ms. Faircloth makes no distinction between her references to "haphazardly developed" programs and the commercially available products listed later in the article.

I would like to take this opportunity to point out that The Landlord and others mentioned in the article were certainly not haphazardly developed. Our program took in excess of one year to design, program and test. During that time we worked closely with professional property managers and owners. Before the program was made available for sale, it was tested and fine-tuned for six months at a 270-unit development in our area. The owner/manager of the development said that the software was appropriate for its intended application, and a CPA reviewed it to assure that it complied with all standard accounting principles.

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I would also like to mention that the retail price of The Landlord was incorrectly stated in the article. The suggested retail price is \$795.

Arthur S. Nacht

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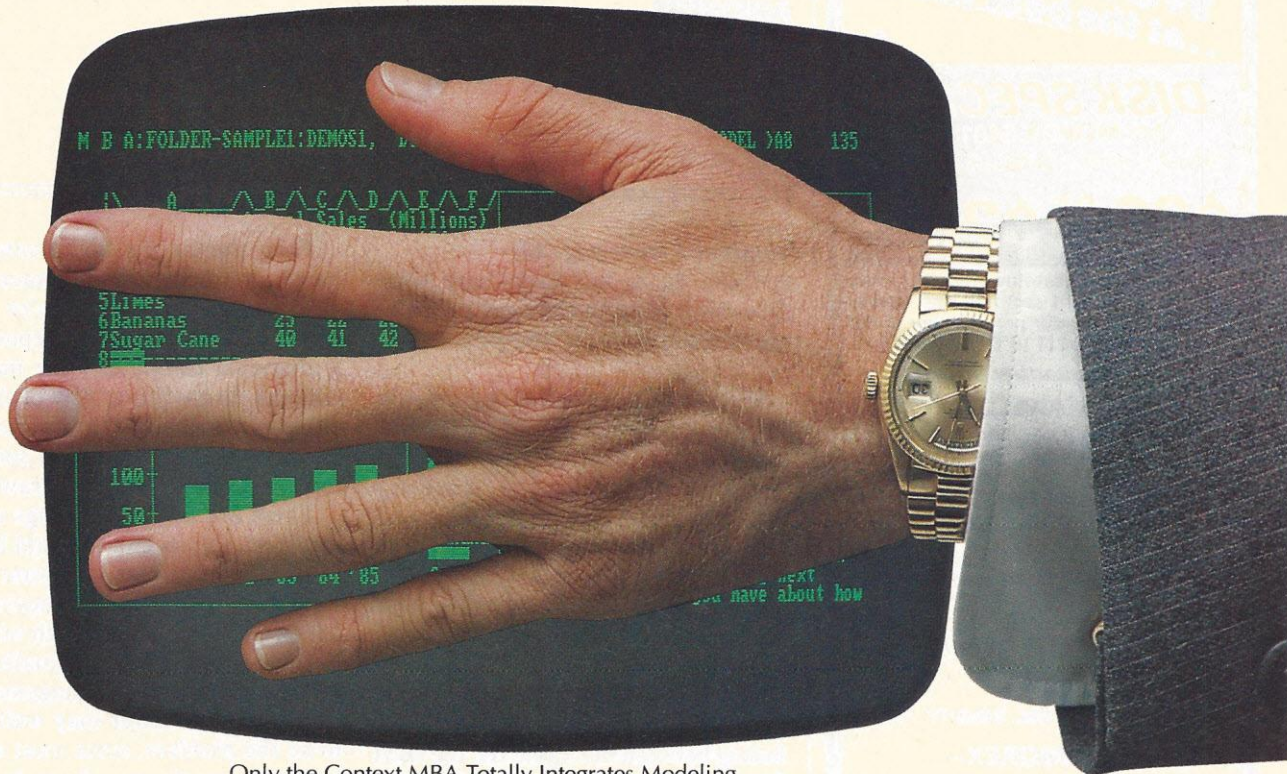


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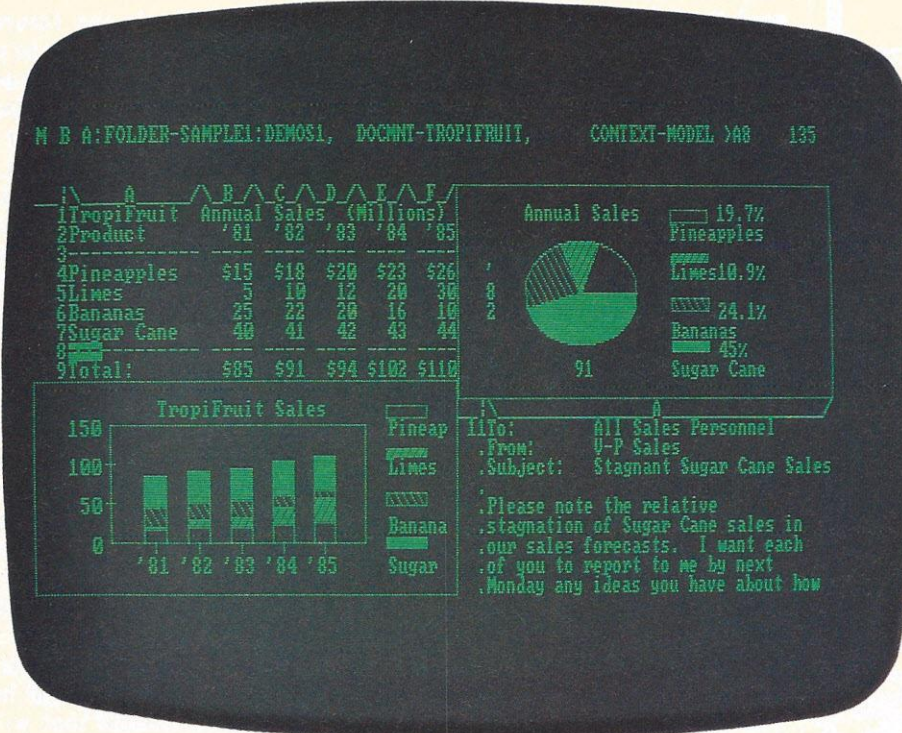


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ANSWERS

(continued from page 16)

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Q: I'm in the process of buying a personal computer, and am debating between the Apple III, the IBM Personal Computer and the Televideo 802. I don't know which one to get. I want to start a home business, but need the flexibility of home management and entertainment on the system. What are the important areas for me to investigate?

A: A plethora of product is available, and although your question mentioned three specific systems, you could be as confused without limiting yourself to those three, or you could eliminate one of them and still not be comfortable.

The problem is the quantity of product vying for attention and the complexity of claims about what each product can do. Sorting out what can be done from what you want to get done isn't easy.

If you want a computer for word processing for a home business, then your choices are almost limitless, because word processing for a home business is probably one of the least demanding applications you could ask of a computer. But you also said you plan to expand into accounting functions with the machine later on. Now the problem becomes trickier. At this point you might decide to get a machine that runs CP/M (Control Program for Microprocessors) because that operating system already has so much business and business-related software written for it.

Then there's the home entertainment and home management you also wanted, so what you're really looking for is a general-purpose programmable computer—the machine that can do anything. Any of the machines you mentioned in your original question will fill the bill to some extent. Any one of them has drawbacks.

There are two basic things to look for. First, the machine should be able to do all the things you want to do right now. This probably means business word processing, which will likely include some kind of mailing-list manager, and home-management capabilities. The latter may well prove to be the problem, since most serious business machines often have no programs for the home written for them.

Second, there's the future. You will almost certainly want to proceed with other applications. The ones you mentioned—the general accounting functions—are available for nearly every computer on the market, except for the very lowest cost models. But in considering expanded applications you have to be careful that the hardware you get can really do the job and can be expanded at not too great a cost.

Expansion means more than just extra memory. You want the machine to provide entertainment. That probably means you should be considering a computer with a color-display capability. And if your home business gets really big (and why not? Apple Computer started as a home business) you'll need other capabilities, like large mass-storage files and a file-backup method. So the machine you choose should have the peripherals available that will allow you to expand as far as you can foresee the need.

Don't think that your analysis now will point out all the hardware you need. It won't. But the machine you get should be able to run what you know you want to do now, expand to handle your foreseeable future appli-

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- Bill of Materials
- Client Billing
- Freight Documentation
- Insertion Orders
- Insurance Claims
- Inventory Ledgers
- Invoices
- Job Estimates
- Medical Records
- Personnel Histories
- Project Scheduling
- Purchase Orders

Unlike any other system, VersaForm gets you started on a computer, working the way you're working now . . . you can even use your existing paper forms.

UNIQUELY DESIGNED TO YOUR OFFICE REQUIREMENTS

Most forms have two parts. The form heading contains information that appears only once on each form, like customer name or project number. The transaction region, below, has a variable number of line item entries which might contain quantities, descriptions, unit costs and extensions. These entries require a system

that does decimal alignment, tax calculations, subtotals, payments, running balances, and allows you to make changes at any time. Ordinary databases simply can't do it.

All these features and more are yours with VersaForm. A spectacularly useful print formatting capability enhances professional forms management. The magic of print formatting is the ability to produce from a single form in your database, several completely different printed forms. For example, from a patient record you can produce a history chart, an insurance claim, a statement and standard dunning notice.

EVERYDAY BUSINESS FORMS DEMAND A TWO-LEVEL RECORD STRUCTURE—

NAME	MICHAEL MOON	DATE	2-21-82
TITLE	PRESIDENT	SLS CODE	500000
FIRM	MICHAEL MOON ASSOCIATES	PROJECT TYPE	AD AGENCY
ADDRESS	2700 SOUTH B ST	CITY	CHICAGO IL 60608
STATE	IL	ZIP	60608
PHONE	312-421-1000	EXP. DATE	

LN	QTY	STOCK	DESCRIPTION	UNIT	EXTENSION
1	1	100000	APPLE II	\$100.00	\$100.00
2	1	200000	IBM PC	\$200.00	\$200.00
3	1	300000	SOFTWARE	\$300.00	\$300.00
4	1	400000	PERMANENT	\$400.00	\$400.00
5	1	500000	SOFTWARE	\$500.00	\$500.00
6	1	600000	SOFTWARE	\$600.00	\$600.00
7	1	700000	SOFTWARE	\$700.00	\$700.00
SUBTOTAL				\$2100.00	
TAX				\$105.00	
TOTAL				\$2205.00	
BALANCE				\$2205.00	

ONLY VERSAFORM HAS IT.

MANAGEMENT REPORTS IN A HURRY

The real power of a forms processing database is evident with VersaForm's reporting facility. You need only point to the data items within a form you want queried, sorted, counted, subtotalled, and totalled. There's no complicated format to enter—VersaForm automatically produces columnar formats, titled, dated and page numbered.

In just minutes, a detail or summary report is automatically produced. What's more, you can run the report again and again without having to re-enter the instructions.

APPLE II/III IBM PC HARD DISK DATABASE?

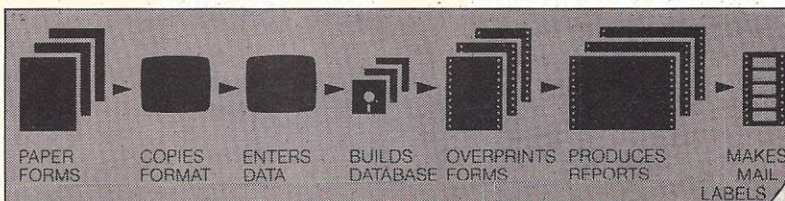
VersaForm supports both floppy and hard disk sub-systems. You can swap data files between different systems through a hard disk-based network. From remote locations data disks can be consolidated into company-wide reports.

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Users say VersaForm is the most powerful and easy to use system around. That's because it's more than just a database; it's a true Business Form Processor.

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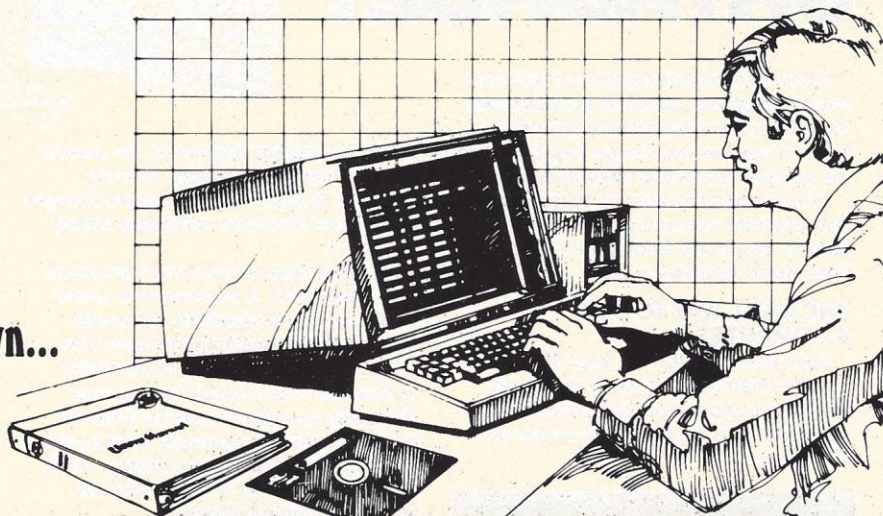
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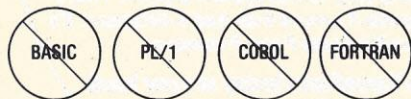
Condor database obsoletes compilers!

Condor relational database management system makes your personal/business computer far simpler to use and much more useful to own... for less money... than other software.



Plain English, no computerese.

Condor relational database management is a complete development and operation system. It eliminates BASIC, PL/1, COBOL, FORTRAN, or other compilers in almost every case. It allows you to deal directly with your information without complex code words. In plain English, it lets you manage your business instead of your data.



Save 90%. Because no complex programming is needed, Condor saves up to 90% of the cost of program writing and testing! You also eliminate costly and time-consuming programmer "talent searches."

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Condor makes traditional programming approaches using compilers *obsolete*. Features such as SORT, DEFINE, ENTER, POST AND REORG permit rapid database creation, access, control, monitoring and manipulation. For instance (by using the JOIN command), you can combine the information contained in two large file cabinets—such as "Purchases" and "Labor Cost"—

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Easiest to learn and use.

Independent evaluators rate Condor *more "user-friendly" than any other personal/business computer database system*. After a brief study of the manual, you start building a database *within 15 or 20 minutes*.

In fact, Condor has allowed many hundreds of first-time users to produce and process their own management reports.



Only \$295 for entry level.

Condor's multi-level modular design provides *full upward compatibility*, up to the most powerful software of its kind in the industry. The entry level Condor I features database file development and management; entry, update,

and posting; inquiry and report writing capabilities; and complete operations aids. And as information needs grow, you can easily upgrade to Condor III for writing highly complex reports and fast-query indexing.



Guaranteed to do more work, more easily for greater savings.

Put Condor to the test. Experience its power and versatility firsthand...how it puts you in direct touch with your data, while eliminating complex programming. You must agree that Condor saves you time, work and money...or return it within 30 days for a complete and prompt refund (at participating dealers only).

Questions? See Condor at your local software dealer, write to P.O. Box 8318, Ann Arbor, MI 48107, or call **(313) 769-3988**.

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cations, and have peripherals available that you can use for applications yet unknown.

One final word. Don't be put off automatically because you can't find just the right software package for the application you're looking for. You may have to program one or two. That isn't as terrible as it sounds. If you approach programming the right way, all it takes is your time, which is a cost tradeoff with other variables. While software availability is a big consideration, which we don't downplay, don't assume that a particular computer is out of the running just because software for one of your applications isn't available. You can write the program, and it might be fun to do.

Q: What is magnetic-bubble memory, and how does it work?

A: It's a kind of memory that uses magnetic recording media, as does a magnetic disk or tape. Unlike those media, however, bubble memory has no moving parts.

Researchers discovered magnetic bubbles by accident when they were fooling around with magnetic properties of certain materials. They observed that if garnet were subjected to a strong enough magnetic field, the magnetic domains formed in the garnet contracted so they were no longer contiguous, and assumed a cylindrical shape. Domains are small regions of magnetic similarity in materials. If the north poles of all the magnetic

domains in a bar of iron are lined up in the same direction, the bar is a magnet. The domains generated in the garnet are visible to the eye if the garnet is illuminated under the influence of the magnetic field with light of the proper spectral characteristics. Looking down into the garnet, a semi-precious stone in its natural state that can be grown in the laboratory under controlled conditions to assume desired shapes, the cylindrical domains look like small circles, or bubbles.

Once the domains are separated they can move. Researchers first moved them by hand, pushing them around in the garnet by moving steel needles over the surface of the material. But they soon found another

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ANSWERS

means—using electrical signals. That was the real genesis of the useful bubble memory.

Today's bubble memories are made from a garnet with a metal pattern laid down over the surface. When the bubbles form they tend to congregate along the metal pattern. As the pattern is pulsed with electrical current signals, the bubbles advance along the metal pattern. As the bubbles advance they pass under a sensing device that can convert the presence of a bubble into an electrical signal. Then, if circuitry is assembled that "understands" the presence of a bubble as a "1" bit and the absence of a bubble as a "0" bit, the sensing device "reads" digital information as the bubbles pass underneath it.

This is, of course, a very simplified explanation of how the bubbles work, but it's essentially correct.

Permanent magnets are used in production bubble-memory devices to maintain the bubbles. That causes one of the drawbacks—bubble memories are heavy. Permanent magnets are relatively heavy devices. Among other drawbacks, the main one is the large amount of power needed to move the bubbles around, to read the bubbles, and to generate new bubbles. That power requirement is a lot bigger than with other kinds of memory.

The principal advantage of bubble memory is its ability to keep its data when the power is off. Semiconductor memory, the kind used in most every

personal-computing application, can't keep its information recorded in the absence of a power supply. Bubble memory can, because the permanent magnets keep the bubbles sitting where the user left them until the power is turned on again.

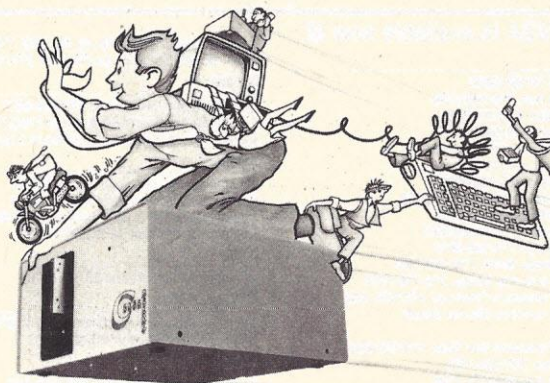
Q: What is so special about amber monitors? I was told they're the best kind one can get.

A: Amber is apparently the best color you can get in a display. Studies undertaken in Europe seem to indicate that people have less eye strain and are more efficient working with an amber computer display than with any other color.

Green is better than white, though. As a result of the European studies,

Performance

Breakthrough...



... the CYBERDRIVE for the IBM Personal Computer

13.5 or 27 million bytes of disk capacity in a single cabinet with an integrated mini-cartridge tape for secure data backup.

Setting an exciting new microcomputer standard, the CYBERDRIVE combines a full package of features.

It offers new, higher performance levels, with an integrated business-oriented backup device.

As the CYBERDRIVE is made available for other systems, media transfer is assured regardless of the host hardware or Operating System.

The CYBERDRIVE slashes the seek time dramatically—e.g. the usual 5 Megabyte stepper-motor Winchester disk offers average seek time typically in the range of 100 to 200 milliseconds (incl. head settling).

With the CYBERDRIVE, the average seek time across more than five times as much data is only 33 milliseconds (incl. head settling).

This basic speed, coupled with disk cache buffering and a peak transfer rate of 1 million bytes per second, make the CYBERDRIVE a performance champ!

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Prices and specifications subject to change without notice.

The integrated mini-cartridge tapes used for backup of data allow dumping of (for example) 10 million bytes of data in about 10 minutes... much faster than other tape or floppy disk backup techniques. Hardware read-after-write error checking is incorporated in the tape device.

... And don't fail to ask about our superb lineup of serious business software (also offered in CYBERDRIVE format) including:

RM/COBOL² compiler—the micro industry standard.

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CBASIC²⁵ & CBASIC⁸⁶⁵ compilers... for aficionados of a useful BASIC.

The software is available on a variety of industry-standard Operating Systems including CP/M⁵, MP/M⁵ (both -80 & -86), OASIS⁶, PC DOS, and UNIX⁷. Inquire for specific details and prices.

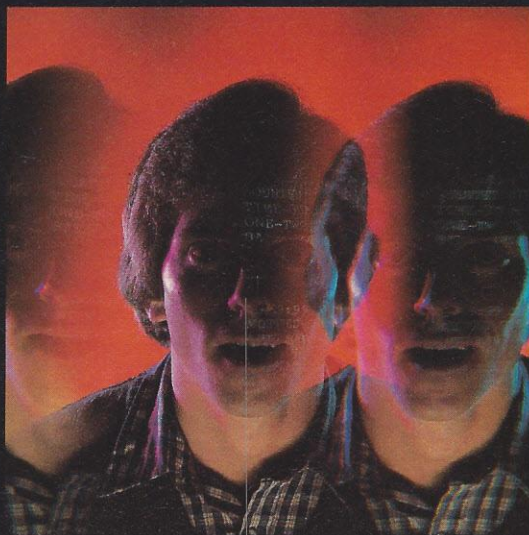


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- SAVVY is an automatic database management system.
- SAVVY is a new level of machine intelligence.
- SAVVY, part hardware, part software, is the beginning of truly "Personal Computing".

What SAVVY does —

Through SAVVY, you and your computer talk to each other in your own natural, conversational English (or Spanish, or French, etc.).

It learns from you what you want done in your own personal language. Once SAVVY learns your language it can create any file you wish. Input, output, additions, changes and deletions are arranged for you.

SAVVY's "Robot Programmer" has been trained to write 100% of the programs needed to manage your database information.

SAVVY runs on CP/MTM and Apple DOS.

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SAVVY continues to grow through use to become better and better at understanding your commands.

Eventually, you will see SAVVY as a mirror to your own way of thinking and working. It is a re-definition of "user-friendly".

SAVVY, it's the first system that truly means "personal computing".

SAVVY is like no other system on earth.

SAVVY cost \$950.

Seeing is believing. SAVVY is on display at selected computer retail locations. Call for the name of your nearest dealer.

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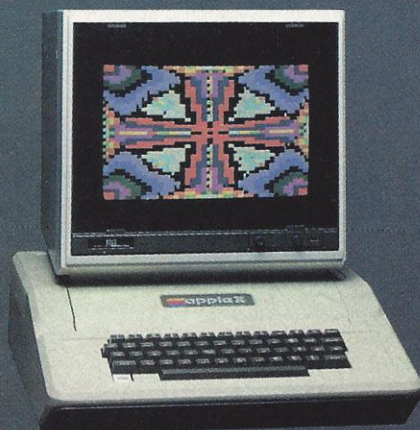
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SAVVY

MARKETING INTERNATIONAL

GOOD NEWS

Have you put aside buying a color monitor because it's too expensive? But, have you looked at the new TAXAN RGBvision color monitor? Would you be excited at a suggested retail price of \$399.00 for the RGBvision I, and \$599 for the RGBvision II?



DO WE HAVE GOOD NEWS FOR YOU!

For those low prices, you can have:

- ✓ Full compatibility with Apple III and IBM PC without interface modules
- ✓ Compatible with Apple II through the TAXAN "RGB-II" card
- ✓ RGBvision I medium resolution - 380(H) lines
- ✓ RGBvision II high resolution - 510(H) lines
- ✓ Unlimited colors through linear amplifier video circuit and 16 colors for Apple III and IBM PC
- ✓ 12-inch, 90° deflection CRT display

Can you really afford to turn all that down without looking at the TAXAN RGBvision monitors? See your local dealer for a demonstration.



TAXAN 12" green phosphor monitor, model KG12N, features an 800 line resolution at center, 2000 character display.



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CIRCLE 53

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ANSWERS

several European countries adopted yellow, amber or green as colors to be used in monochromatic displays. In every case, compared with black-and-white monitors, the colored monitors resulted in less eye strain and greater efficiency. When the colors were compared among themselves, amber won hands down.

Many manufacturers now make amber displays, but not many of those show up in the U.S. market because most of those products are being shipped to Europe. This will change, however. At least one manufacturer, USI International, of Brisbane, Calif., showed nine-inch amber monitors for personal computers at this year's National Computer Conference.

Q: What's a printer/plotter? Can it do both printing and plotting?


A: Yes. It's a device that can both print and plot.

Some hard-copy output devices are optimized for printing, others for plotting. A printer/plotter does both jobs tolerably well.

Some printer/plotters are dot-matrix types. When they print, they use characters that are made up of dots arranged in a matrix to form the character—hence their name. When they plot, they use dots to form the lines of the picture they're plotting. Dot-matrix printer/plotters are OK, depending on their dot resolution. The more dots per inch they can place on the paper, the better the

lines and characters will look.

Other printer/plotters use pens to draw lines. They move the pen over the paper to form the characters. They are relatively slow compared to dot-matrix types, but their output looks better than the output of dot-matrix printer/plotters. They are also relatively expensive. Pen plotters cost about \$1500.

Probably the best known printer/plotter is one from Versatek, which print 200 dots per inch and runs almost as fast as a line printer. It's an electrostatic device, which means that it places dots of electric charge on the paper, the paper passes over a pigment reservoir, and the pigment is attracted to the areas of electrical charge. 

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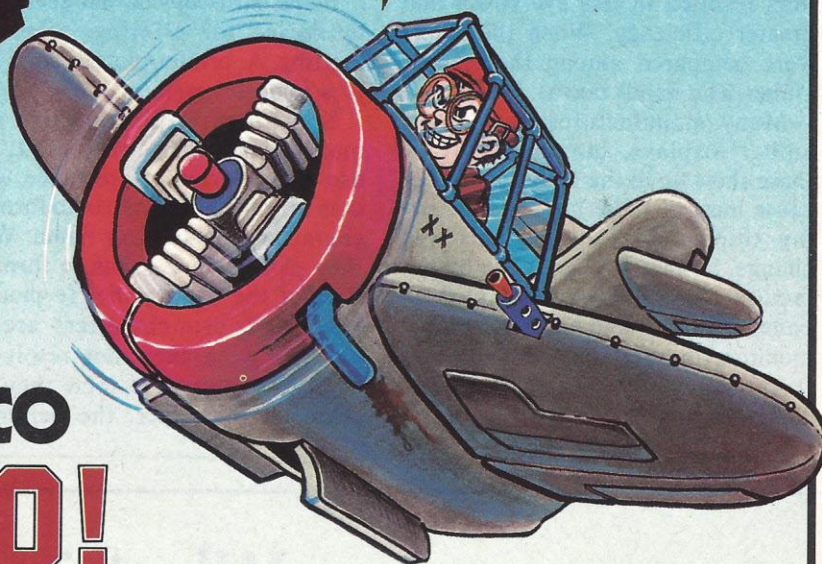
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Play your best game and send us a photograph of your highest score. We'll take the top 5 scores submitted and send those overachievers tickets to San Francisco for the "Kamikaze Shootout" next February. We'll reserve hotel rooms, good food and 5 Apple computers, each loaded with Kamikaze ... then may the best gunner win!

Rules:

1. One entry per purchased copy (the entry blank comes with the game).
2. Entry blank must include the registration number of your game. The warranty registration must be signed and in the possession of Hayden Software for verification.
3. Entry blank must be signed by the registered owner and the person who achieved the high score.
4. Minors must have scores attested by their parent or legal guardian. Score must be achieved by playing the game.



5. Advertisers and employees of Hayden Publishing Co., Inc., and its affiliates, or members of their families are not eligible.
6. In the case of duplicate high scores, the earliest postmark will have priority. Any entries with illegible postmarks or illegible entry information will be returned or rejected.

Top scorer takes home a cool \$5000; second place gets you \$1000; third place wins \$500; fourth and fifth place winners each receive \$250 certificates good toward Hayden software.

The only way to win is to play ... the only way to play is to get your Kamikaze game with your entry blank from a Hayden Software dealer, or order direct at:

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The sooner you start, the more practice you get. But beware ... the better you get, the tougher the challenge — surprise enemies will be popping up all over!

Deadline for entries is January 15, 1983, and winners will be notified by January 31, 1983. "Shootout" winners will be published in the April issue of Personal Computing magazine.

Kamikaze, #13809, Apple II disk, \$34.95

HAYDEN SOFTWARE

PROFESSIONAL/ MANAGERIAL

**"Should you delay purchasing?
Most experts in the area
say it makes very little
sense to wait."**

WHAT SHOULD YOU PAY?

(continued from page 64)

has the most moving parts, the printer is the most expensive component of a computer system and the most trouble-prone.

A dot-matrix printer makes sense when you need an economical printer for internal use only. It forms letters from tiny dots. Matrix printers are your least expensive, starting around \$200 for those using adding-machine-width paper. Disadvantages: Usually characters are hard to read and special coated paper might be required.

If you do enough looking, you might find an inexpensive, good quality dot-matrix printer. "Ours is clear, crisp and attractive," says Pat Pav-

lick of Floral Creations in Danbury, Conn. "The printer produces our letters for prospective customers. It cost just \$500."

For correspondence, reports and other material where readability and appearance are important, you're more likely to settle on a letter-quality printer. It forms characters like a typewriter by striking the page with a typewriter-like font. Perhaps the least expensive versions are converted IBM Selectrics with the font on a ball. Daisywheel printers are a popular alternative. Manufacturers offer a wide choice of typefaces, both pica and elite sizes. Letter-quality printer prices start around \$1000 and can go up as high as close to \$5000.

Comparatively slow printers—

maybe 15 characters per second or a page every couple of minutes—are fine for light printing. With heavy printing requirements, though, such speeds can become a bottleneck. You might be better off purchasing a printer capable of 40 to 60 characters a second, or even more. Naturally, extra speed adds cost.

Continuous printing proceeds much faster with an automatic paper feed. Otherwise, somebody has to hover over the machine and feed sheets in, one at a time. An automatic paper feed sells for about \$2000.

• *What kind of follow-up service?* A computer is perhaps more reliable than most products of modern technology. Even so, it can break down.

What's the key to success in futures trading?

Fast, accurate information is essential in business decisions. How often have you learned about golden opportunities in the commodity markets *after* it was too late to really profit by them?

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PROFESSIONAL/ MANAGERIAL

"I feel that the longer you delay implementing a computer system, the more money you lose. I should have had a computer years ago."

In most cases you're dependent on the dealer. Tony Passera, a Ridgefield, Conn. computer consultant and researcher, reports: "My keyboard failed this week. The machine diagnosed the problem itself, gave me a message telling me which part failed, and I just took it to a computer store—not even the one I bought the computer from. On the spot, in five minutes, they replaced the part."

You won't always be this fortunate. Ask how fast a dealer promises a service response, how many service people are available, the cost. Few dealers offer on-site service. Expect to haul your equipment to the dealer. If a dealer goes out of business, where else can you turn?


Ask for names of a store's custom-

ers, so you can ask about follow-up service. Don't buy from anybody who won't give you some names.

Details of a service agreement must be in writing. This is especially important if you buy a second-hand or discontinued computer that a store might not want to service.

OK. Having determined what you want a personal computer to do, you should have a good idea what kind of programs, memory, storage, monitor, keyboard, printer and follow-up service you want. Make a list of the essentials. This will help you narrow the possibilities quickly, because most computers will lack at least one. Then, as Tony Passera did, seek "the least expensive machine that gives you the function you need."

Should you delay purchasing until a more advanced, less expensive system comes along? Most experts in this area say it makes very little sense to wait. The immediate advantages that a business can expect from owning a computer will in most cases outweigh any savings that it might accrue by putting off the purchase.

Personal-computer prices have come down substantially since Herbert Schlomann paid \$8500 for his a few years ago, but he doesn't mind. "If you do your homework and buy a computer suited to your needs, it can revolutionize your business. I feel that the longer you delay implementing a computer system, the more money you lose. I should have had a computer years ago." 

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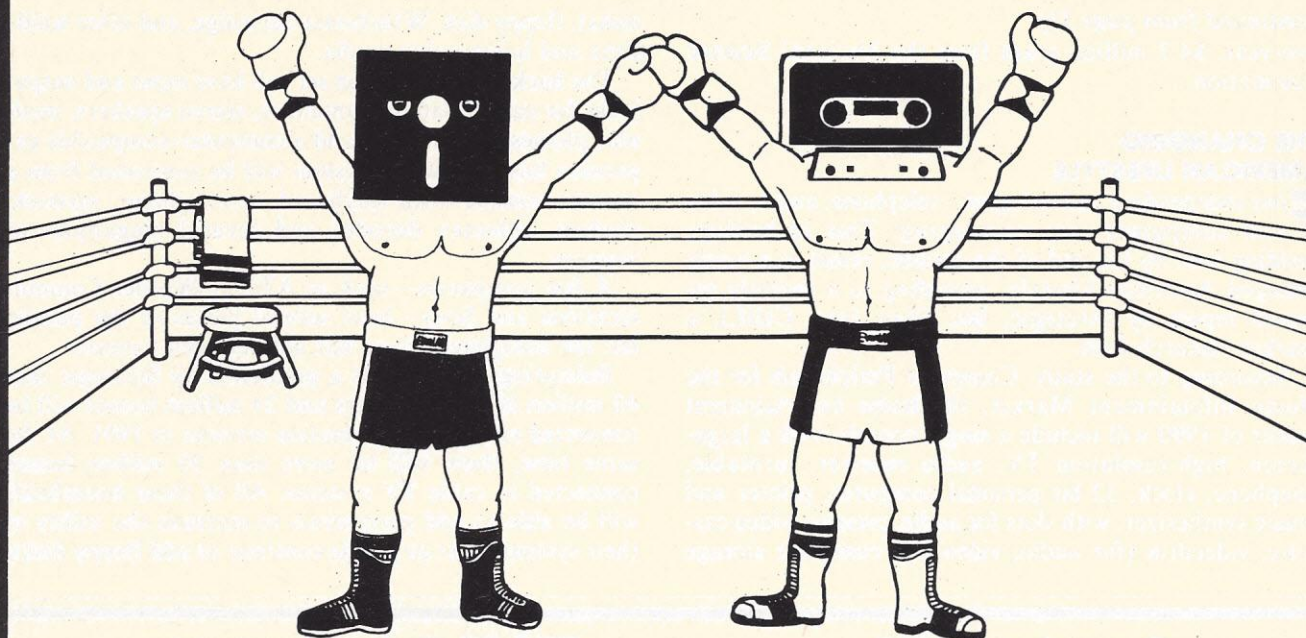
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OUTLOOK

(continued from page 31)

five-year, \$4.7 million grant from the National Science Foundation.

THE CHANGING AMERICAN LIFESTYLE

Four independent technologies—telephone, audio, video and computers—are converging. This technology melding will, by the end of the decade, result in a vastly changed American lifestyle, according to a recently released report by Strategic, Inc. (San Jose, Calif.), a market-research firm.

According to the study, Computer Peripherals for the Home Infotainment Market, the home entertainment center of 1990 will include a single console with a large-screen, high-resolution TV, audio receiver, turntable, telephone, clock, 32-bit personal computer, printer and music synthesizer, with slots for audio cassette, video cassette, videodisk (for audio, video and computer storage

disks), floppy disk, Winchester cartridge, and other solid-state and holographic media.

The back of the television set will have input and output jacks for cables, satellite antennas, stereo speakers, modular phones, power plugs and a computer-compatible expansion bus. The whole system will be controlled from a remote console with keyboard, microphone, joystick, modem, videotex decoder and several megabytes of memory.

A few companies—such as AT&T, Warner Communications and Sony—have several pieces of the puzzle, but the complete picture has not yet been formed.

Bolstering the report is a prediction by Strategic that 40 million home computers and 24 million homes will be connected to remote information services in 1991. At the same time, there will be more than 30 million homes connected to cable TV systems. All of these households will be able to add peripherals to increase the utility of their systems, just as people continue to add floppy disks,

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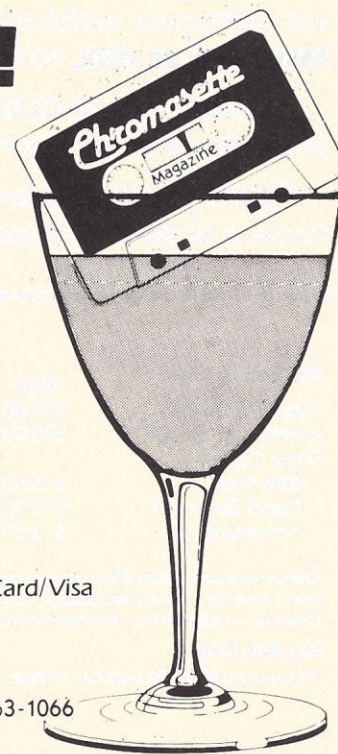
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PERSONAL COLOR GRAPHICS

Personal Color Graphics Has Arrived

Turn your IBM PC, Apple II, or Apple III into a color graphics system by adding a PrintaColor PG-1000. Personal graphics ...in color...at your finger tips. The PG-1000 transforms dull and difficult to understand graphics into easily understood vivid color images. PrintaColor's PG-1000 is the perfect blend of printer capabilities, making available for the first time one printer that combines quality text, graphics and color.

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The PG-1000 is designed for the professional who requires high quality color output in minutes, not hours. Utilizing ink-jet technology, precision images containing over 125 shades of colors can be produced. An 8½ by 11 inch image is produced typically in under two minutes. 1440 dots per line give your copies the crisp definition required for detailed graphics.

Easy To Use

PrintaColor's PG-1000 is designed to be at home in any office environment. Whisper quiet operation and compact size allow the PG-1000 to be your desk-top printing companion. Color images are produced on readily available computer paper. The ink is contained in a snap-in, disposable cartridge which inserts in seconds, producing on average over five hundred color copies. There is no

waiting for inks to dry, pens to clog, and no ribbon to replace. Multiple copies are as easy as keying in the number desired...each an original.

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The PG-1000 is a complete color printing system including everything you need from the printer to a box of paper. From the moment you unpack your printing system you are ready to begin producing color graphic images with your personal computer. An easy to install interface card and cable connects the printer to your system. Software is included to facilitate copying the graphic screen in color, whether you use a black and white or a color monitor.

A box of paper and an ink cartridge rounds out a complete compliment of items that allow color printing from your own graphics software or many commercially available software packages. Retail price \$4,995.

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CIRCLE 104





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OUTLOOK

modems, and printers to their computers, and VCRs to their TV sets.

"ROAD INTO SPACE" WINS SWEEPSTAKES

When Ben Lanterman bought an Epson MX-100 printer a few months ago, he never dreamed it might take him to Japan. Lanterman, a 39-year old aerodynamicist from Bridgton, Mo., has been named the grand prize winner in the Epson "Softwear" Sweepstakes. And his winning printer graphic, entitled "Road into Space," has won him a week's stay for two in Tokyo, courtesy of Epson America. The design will be used on the official Epson T-shirt.

Lanterman says he got into computers "a couple of years ago," when his 10-year-old son, Aaron, expressed an interest in the subject. His painting led Lanterman into

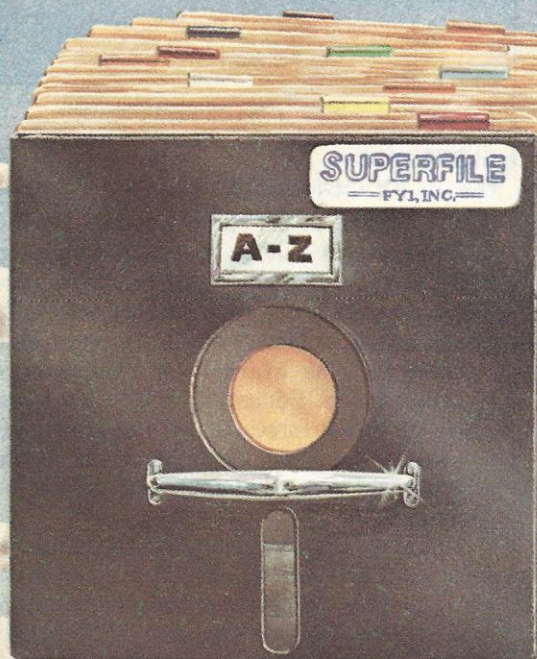


Ben Lanterman, his wife Bonnie, and son Aaron, look on as their Epson MX-100 printer recreates the grand prize winning entry, "Road Into Space," for which they won a trip to Japan.

computer and printer graphics. Lanterman says he soon outgrew the printer, which came with his original Apple II system, and became interested in Epson printers after having seen a graphic demonstration.

The design came about, he says, when he was playing with the Epson name on the screen, and his wife, Bonnie, suggested he make it recede into space and add a few planets to amplify the space theme. Lanterman made about 20 separate entries to the Epson contest, working an average of 10 to 15 hours to perfect each entry.

Other winners in the contest were F.S. Kalinowski of Orlando, Fla., who won an Epson MX-100 for his second place entry, and John Stedford of Twin Falls, Idaho, who won his-and-hers Seiko quartz watches as third prize.



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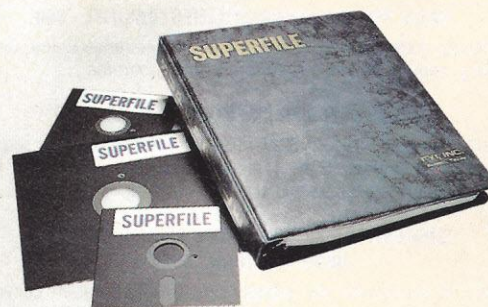
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CIRCLE 141

OUTLOOK

MORE KIDS LEARN BY COMPUTER

Fifty percent of the student population in U.S. schools and colleges will be receiving computer-assisted instruction (CAI) by 1987. That's up from about 25 percent today, according to a recently released study by Frost & Sullivan, Inc., a New York-based research firm.

Entitled "The Market for Computer Assisted Instruction in U.S. Education: A Five Year Projection," the 259-page report forecasts that the growth of CAI will be due mainly to personal computers. The machines not only afford lower costs, but represent greater autonomy for educators.

This scenario applies to all three categories of schools surveyed—elementary/secondary, community colleges, and four-year colleges and universities. Community colleges will pace the growth, with 52 percent of the schools now using CAI increasing to 85 percent in 1987.

Students will be exposed to more simulation and tutorials, a change from purely drill-and-practice exercises that are so common today, the report states.

The elementary/secondary schools—the newest entrants to CAI—plan to double the number of personal computers to about 424,000 units in 1987; the amount of districts using CAI will increase from 65 percent to 80 percent.

Despite the favorable outlook for CAI, two problems loom: lack of knowledgeable practitioners to serve as consultants and the slow development of peer-reviewed quality courseware. The latter has led to a large number of specialty companies and distributors entering the field.

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To use the service, subscribers sign on to The Source with a personal computer, data terminal or communicating word processor. They then type MGRAM and are prompted to enter names, addresses and messages. Messages can be reviewed on the screen, and changes in text can be made before transmission. Messages can be sent to single or multiple addresses. There is no limit to the number of messages that can be sent.

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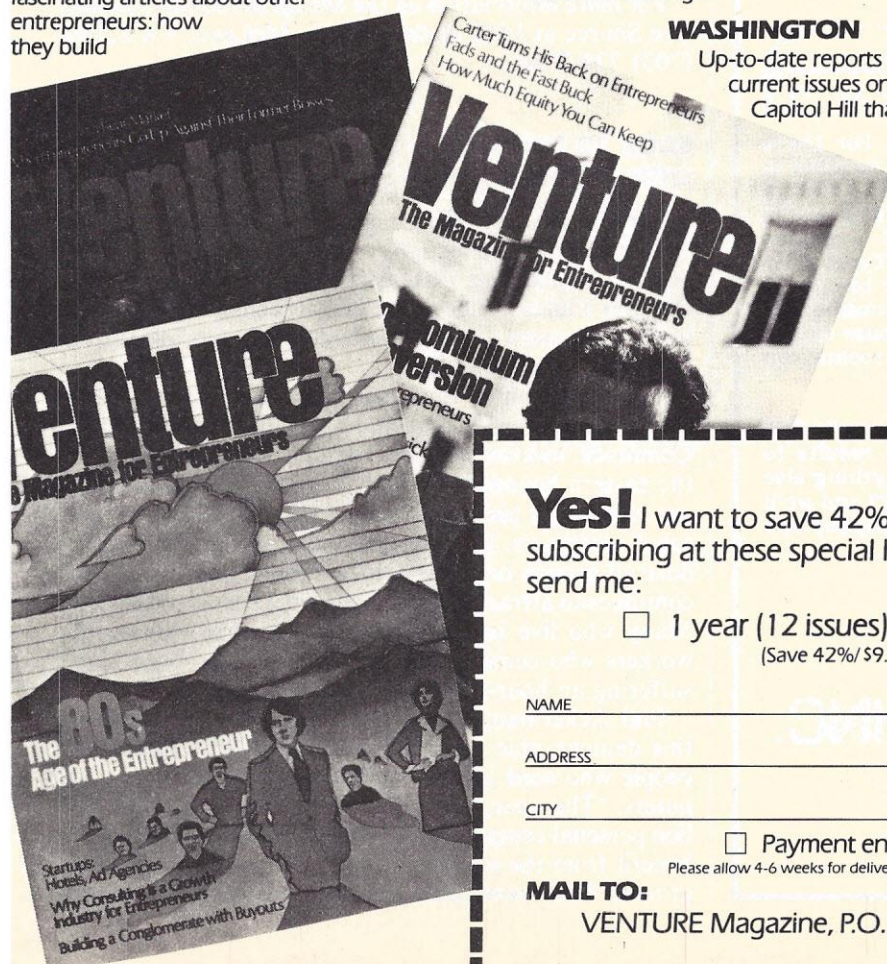
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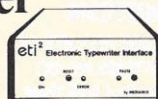
If You Have A Printer

You need our PRINTER OPTIMIZER. We have two gripes with computer printers: one, no matter how fast they print they're much slower than a computer. So here you are with all this processing speed, sitting there waiting for your printer to finish. Two, almost all printers offer a bunch of features like various type sizes, forms control, graphics, enlarged character sets, etc. - but how are you supposed to access these features? Oh sure, the printer manual says: "print an ESC character followed by a CONTROL "K" followed by a three digit value equal to the desired page length...", but how do you do this in the middle of your spreadsheet program? And how do you access all those extra symbols and graphics with a puny half-ASCII keyboard?



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OUTLOOK

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For more information on the Mailgram service, contact The Source at 1616 Anderson Rd., McLean, VA 22102; (703) 734-7500.

BACK TO SCHOOL WITH A COMPUTER

With the exploding sales figures the personal computing industry is presently experiencing, more people are deciding that teaching about the small machines is a lucrative business. Hence, centers that propose to teach business executives about computers are springing up all over the country.

One such center that just came to *Personal Computing's* attention is Entech, located in Commack, N.Y. Commack, located on Long Island about 60 miles east of the eastern boundary of New York City, is a somewhat out-of-the-way place for a school that teaches about personal computers. But the area has experienced some industrial growth over the past few years, and this growth continues to attract management-level people to the area. Many who live in the Commack area are white-collar workers who commute every work day into New York, suffering an hour-long train ride each way.

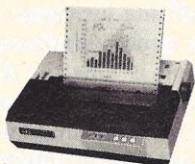
Phil Ackerman, Entech president, clearly hopes that this demographic mix will result in a large number of people who need instruction in the use of personal computers. "This year," says Ackerman, "more than one million personal computers will be sold. Most purchasers can benefit from the equipment but have no computer background. Until now there has been no place in this area

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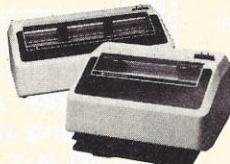


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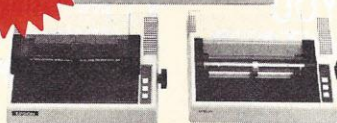
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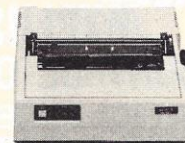
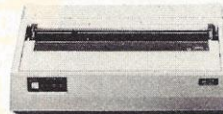
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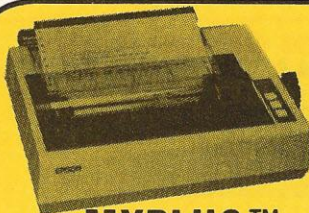
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OUTLOOK

where unbiased professional help could be obtained. Entech, the Computer Skills Center, was created to fill that need."

Entech proposes to teach people all they need to know about selecting and using a personal computer. It offers seminars on topics ranging from the essentials—assuming no prior knowledge—to the advanced operation of the most sophisticated hardware and software available. The classes are being taught, says Ackerman, in Entech's modern facility, although arrangements can be made for custom training programs at off-site locations.

Maude Ackerman, who has been a professional educator for a number of years and is now the director of Entech, says that most of the customers the company is getting are from the local area. "We opened this center," she says, "with a tremendous amount of interest. We're right next to an industrial park here, and most of the people who are coming in are businessmen from this area. But right now Phil is talking to some people from New York about setting up a training program to be taught there."

Entech seminars will cover such topics as:

- Selecting and using a computer for your business or profession;
- Forecasting with VisiCalc/SuperCalc;
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- Programming in BASIC; and
- Word-processing hardware and software.


Entech will provide training in a variety of word-processing software packages on Apple and IBM personal computers.

For more information, call Entech at (516) 543-3352.

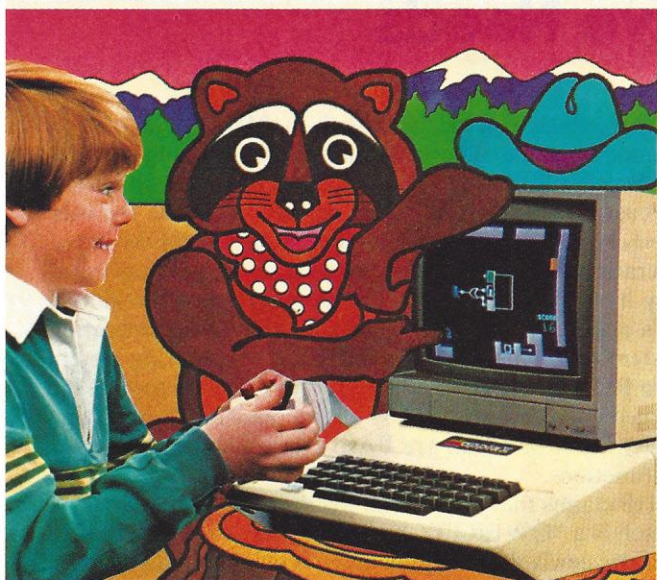
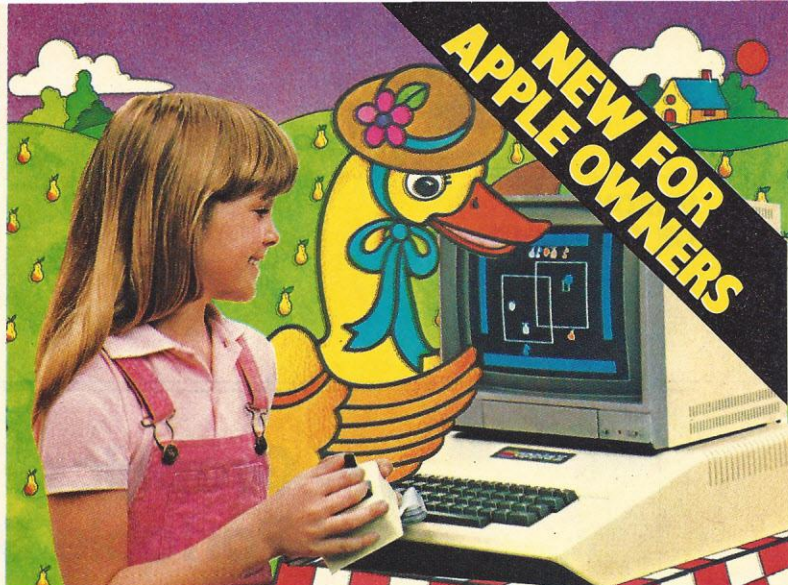
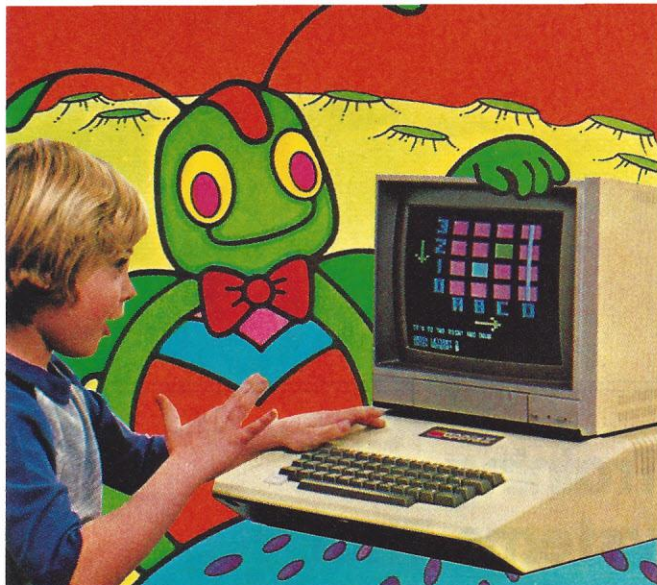
VIDEO GAME BUSINESS TO SHIFT TO PERSONAL COMPUTERS

The home/video game business of the 1980s will shift in emphasis from stand-alone units to the growing base of installed personal computers, according to a 210-page report from International Resource Development, a Connecticut-based market-research firm.

The study, Video Market Opportunities, estimates that by 1990, about 35 percent of homes in the United States will have some type of video game system. Increasingly, however, traditional units will be passed over in favor of games-capable personal computers. The attraction, according to the report, is that as the technology improves and becomes cheaper, personal computers will become fully competitive with dedicated video game machines while offering much more overall utility to the user.

Nearly \$4 billion worth of games-oriented personal computers, those generally retailing for less than \$1000, will be sold in 1992, the report says. This figure represents approximately one-quarter of the entire market. 

CIRCLE 110



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PORTABLE COMPUTING POWER

With its new HP-75C hand-held computer, Hewlett-Packard is bridging the gap between its desktop computers, like its Series 80 machines, and even smaller computers, like the 41C.

This new machine can be programmed in BASIC, and will be provided with the ability to do graphics and spreadsheets. It is truly portable, thanks to its memory that can retain data while the power is off, and its small (10-inch by 5-inch by 1.25-inch) size.

The machine also features a built-in Hewlett-Packard Interface Loop (HPIL) that allows this machine to communicate with other HP personal computers. Thus it can act almost as a peripheral device to larger personal computers.

The company thinks that initial customers for this computer will come from the firm's traditional base of customers—technical and financial professionals. But that focus will shift very soon because new software will be available to tempt the “mobile” businessman who needs, or just wants, access to information wherever he might be, the company says.

The HP-75C portable computer features 16k of user

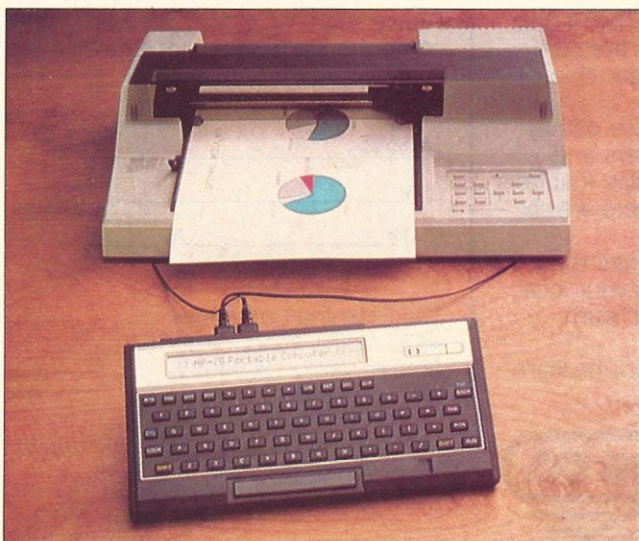
RAM, which can be increased to 24k with a plug-in memory module. There are three software plug-in ports that accept 8k or 16k ROM modules so the machine can be customized for particular applications, while the user memory is kept free for data. There's also a ROM-based operating system that takes up 48k, so the user can actually have as much as 120k of memory going for him, if he's added the 24k expansion and counts the operating system's RAM in the package. Since the operating system is in ROM, the computer is ready for action as soon as it's turned on. The user has 169 instructions to the operating system, 147 of which are BASIC commands, statements or functions.

HP claims that owners can touch-type on the keyboard, which is a “QWERTY” pad. Every key can be redefined and the newly defined keys given new labels with snap-on keyboard overlays. The keyboard also has a “hidden” numeric pad for entry of large volumes of numeric data. The liquid-crystal display is only one line of 32 characters, but it acts as a window on a larger, 96-character line. If the user purchases an optional video monitor, the computer can display a normal page of data (16 lines by 32 characters).

For program or data storage, HP has included a pull-through magnetic-card reader. Cards can store 1.3k. The reader is a pull-through device rather than a powered one, which saves battery life.

A real-time clock is an unusual feature in a machine like this. With it the user can key in a future appointment, and have the machine alert him for the appointment at the proper time and date. Or the computer can store the time to run a program in its battery-backed-up CMOS (Complimentary Metal Oxide Semiconductor) memory, wake itself up at that time and run the program. As Jim Fremont, product manager for the HP-75C computer, says, “The HP-75C is so power-efficient it doesn't even have an on-off switch. The user simply calls it to various states of attention.” While the machine is running that program, it can call on files that have been previously stored, including program, appointment and data files, all of which can interact with each other.

The BASIC language is built into the machine's ROM, so users can program the HP-75 for their specific applications. But HP also has (as of September 15) software solution “books” available. The initial books include



The HP-75C hand-held computer is truly portable thanks to its size (10 by 5 by 1.25 inches) and its data-retention capabilities.

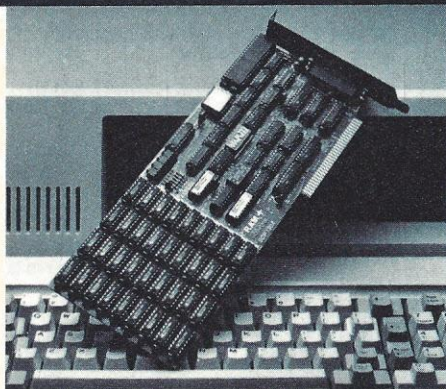
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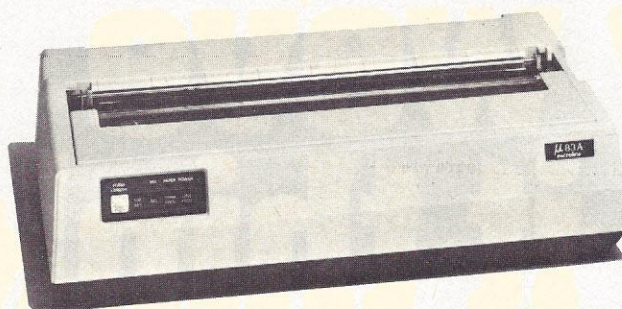
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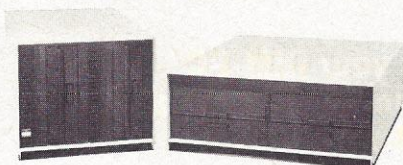
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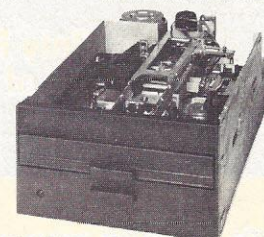
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HARDWARE OF THE MONTH

finance/investment; real estate; math I, II and III; input/output (needed with the available modem) statistics; electrical engineering; and games. The company will introduce a graphics solution book early in 1983. The solution books will be available on either cassette tape for the cassette drive that's an available option, or on the magnetic cards for the pull-through reader. Software will also be available in ROM packs in early 1983, and this software will cover other application areas. Such application modules will cost about \$150, the company says, while the solution books will cost \$10 each.

Also available early next year will be what HP calls "core" software—that which is useful to all computer owners. This includes graphic presentation software, electronic spreadsheets, file management, memo writing, data communications and personal time management. They will all be available in plug-in ROM.

The computer can work alone, in a briefcase system, or on a desk top where it can interface with many different peripherals, such as printers, plotters and video monitors.

A briefcase system includes a digital cassette tape drive, a thermal printer/plotter and an acoustic modem.

The HP-75C hand-held computer is priced at \$995. It should be available now from HP and its dealers.

FOR MORE INFORMATION: Inquiries Manager, HEWLETT-PACKARD CO., 1820 Embarcadero Rd., Palo Alto, CA 94303.


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Trying to train your people faster and more effectively? Looking for another way to test market response for a new product? Reactive Systems, Inc. has the answer. The firm has just introduced the Voter 30, a hardware/software package which links up to 30 participants to a single Apple II computer.

"Voter 30 turns your Apple II computer into a group response system," says Laird Kelly, president of Reactive Systems. "A classroom of participants can respond to multiple choice questions and instructor and participants all see the results immediately."

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3	200.0	220.0	242.0	266.2	928.2	46
4	300.0	350.0	400.0	450.0	1,500.0	47
5	950.0	1,059.5	1,174.4	1,295.2	4,479.1	48
6	50.0	40.5	35.6	35.8	161.9	49
7	5.0	3.7	2.9	2.7	3.5	50
8	0.0	0.0	0.0	0.0	0.0	51
9	0.0	0.0	0.0	0.0	0.0	52
10	45.0	44.5	44.0	43.5	0.0	53
11	0.0	0.0	0.0	0.0	0.0	54
12	0.0	0.0	0.0	0.0	0.0	55
13	0.0	0.0	0.0	0.0	0.0	56
14	0.0	0.0	0.0	0.0	0.0	57
15	0.0	0.0	0.0	0.0	0.0	58
16	0.0	0.0	0.0	0.0	0.0	59
17	0.0	0.0	0.0	0.0	0.0	

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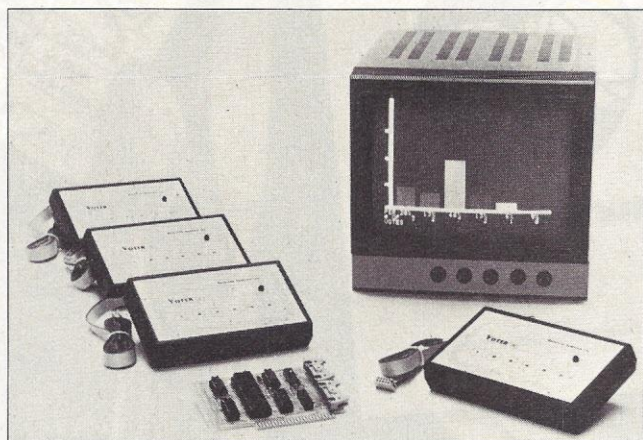
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HARDWARE OF THE MONTH

answers to the questions which are then projected onto a screen, usually via slides. After the participants answer



VOTER 30 transforms an Apple II personal computer into a group-response system for up to 30 people.

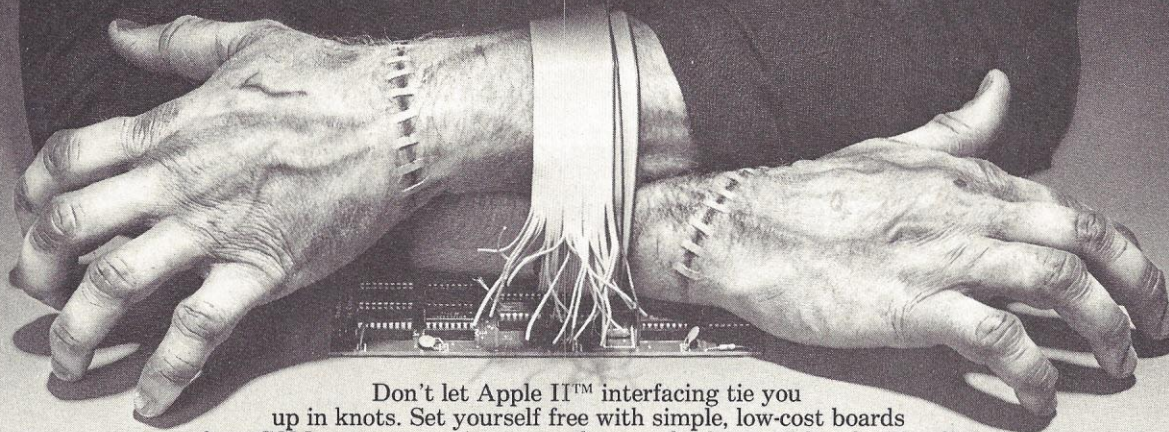
each question, Voter 30 tabulates the results and produces a bar chart of the responses onto a video screen. Hard copies of the results can also be made.

Voter 30 is useful for testing and market research applications because it keeps track of both individual and group responses. The system comes equipped with BASIC language programs designed to help those without programming skills write quizzes and retrieve and analyze test results. Diagnostic software will confirm whether the system is installed correctly.

"As a training aid, Voter 30 is extremely flexible," says Kelly. "It keeps people actively involved in training sessions by requiring each to answer throughout the period. The system also saves training time by helping the instructor to pinpoint the specific areas in which the trainees need more work. In addition, Voter 30 works in conjunction with other educational software, random video systems and multiple video displays. Polling stations can be ordered in any quantity to fit a company's needs."

(continued on page 206)

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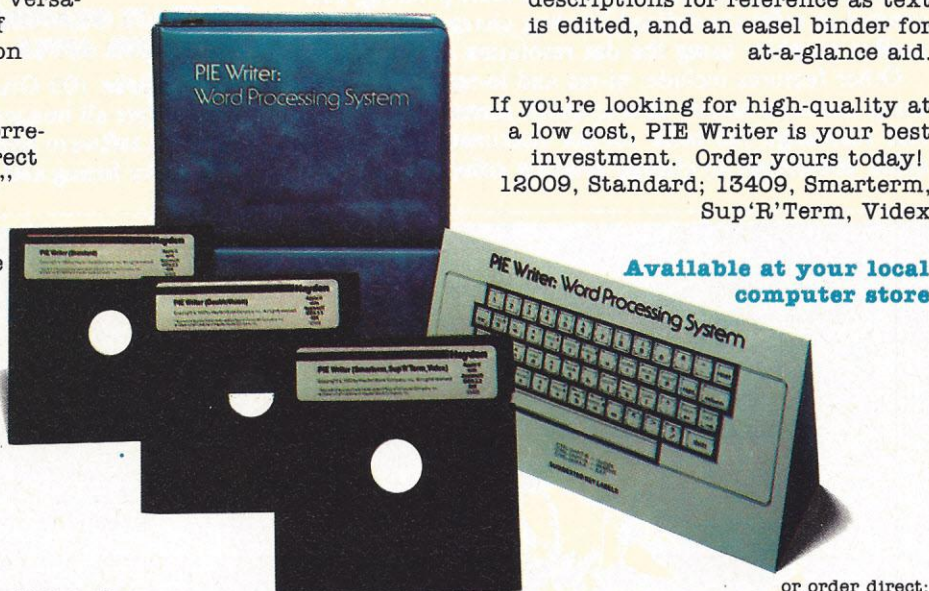
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HARDWARE OF THE MONTH

(continued from page 203)

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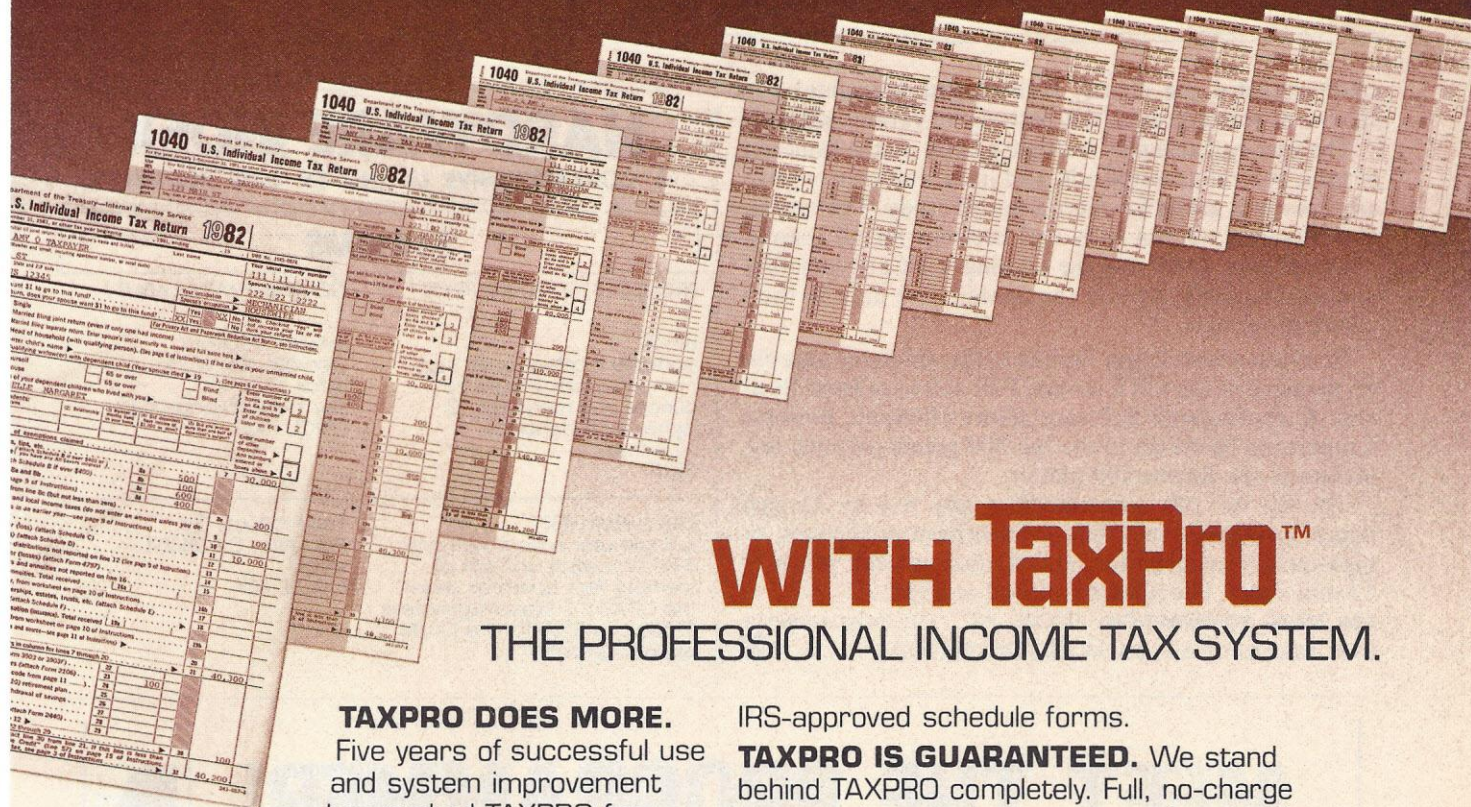


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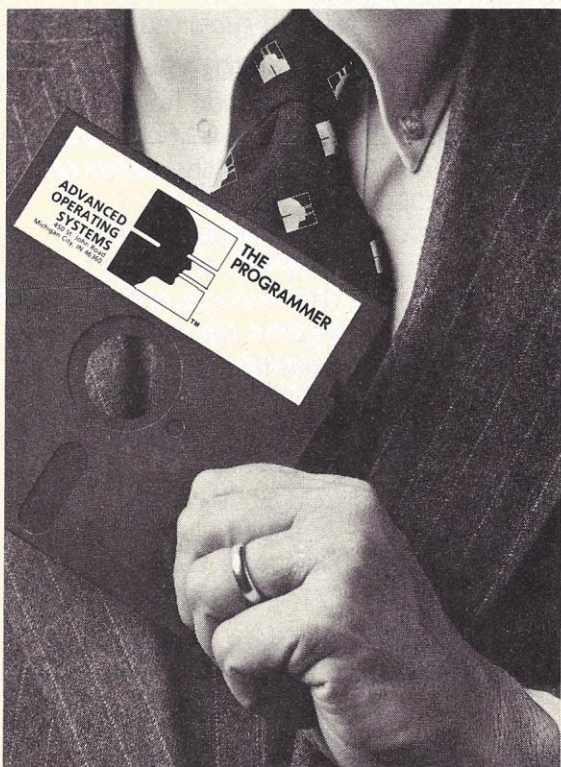
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(continued on page 215)

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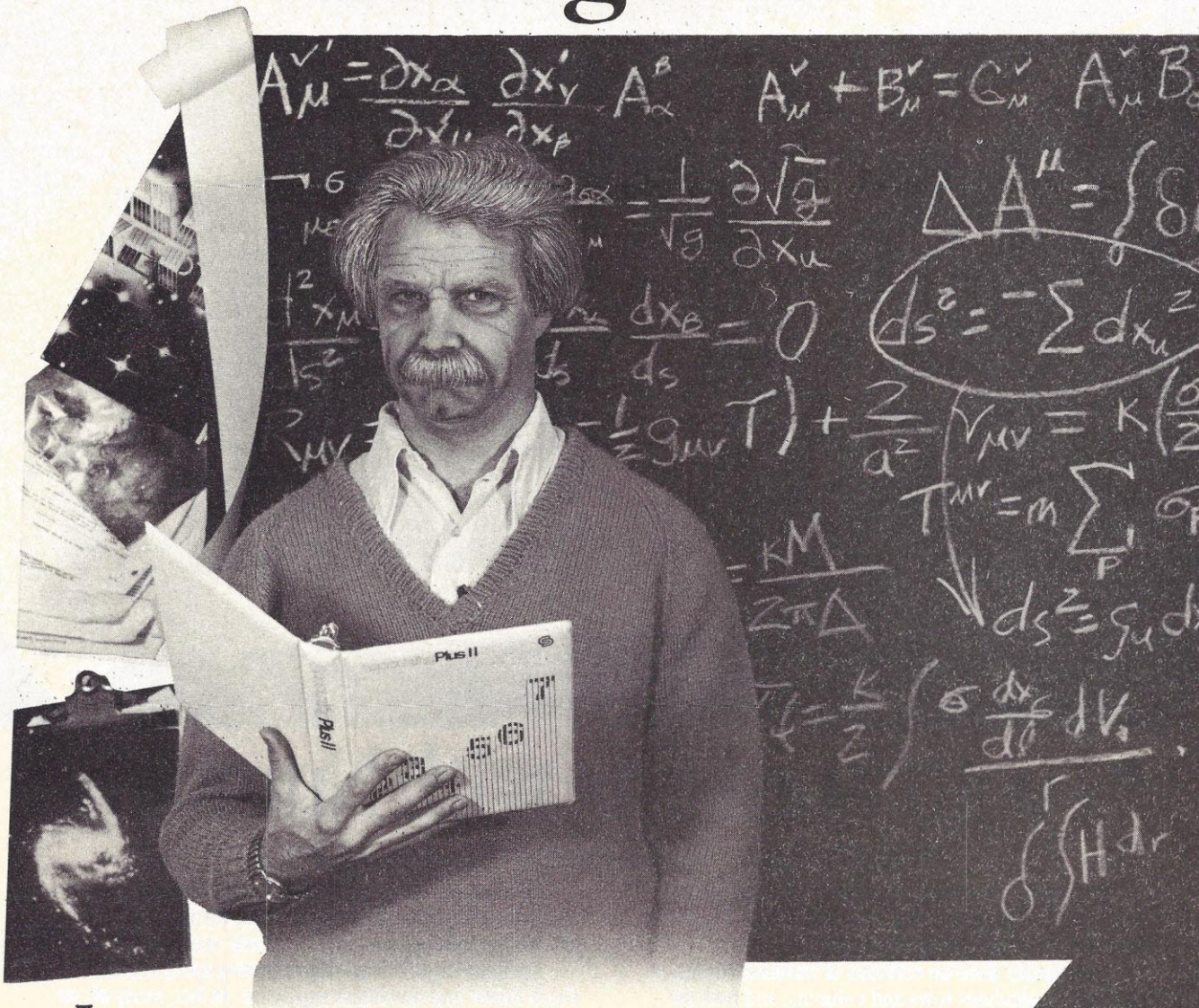
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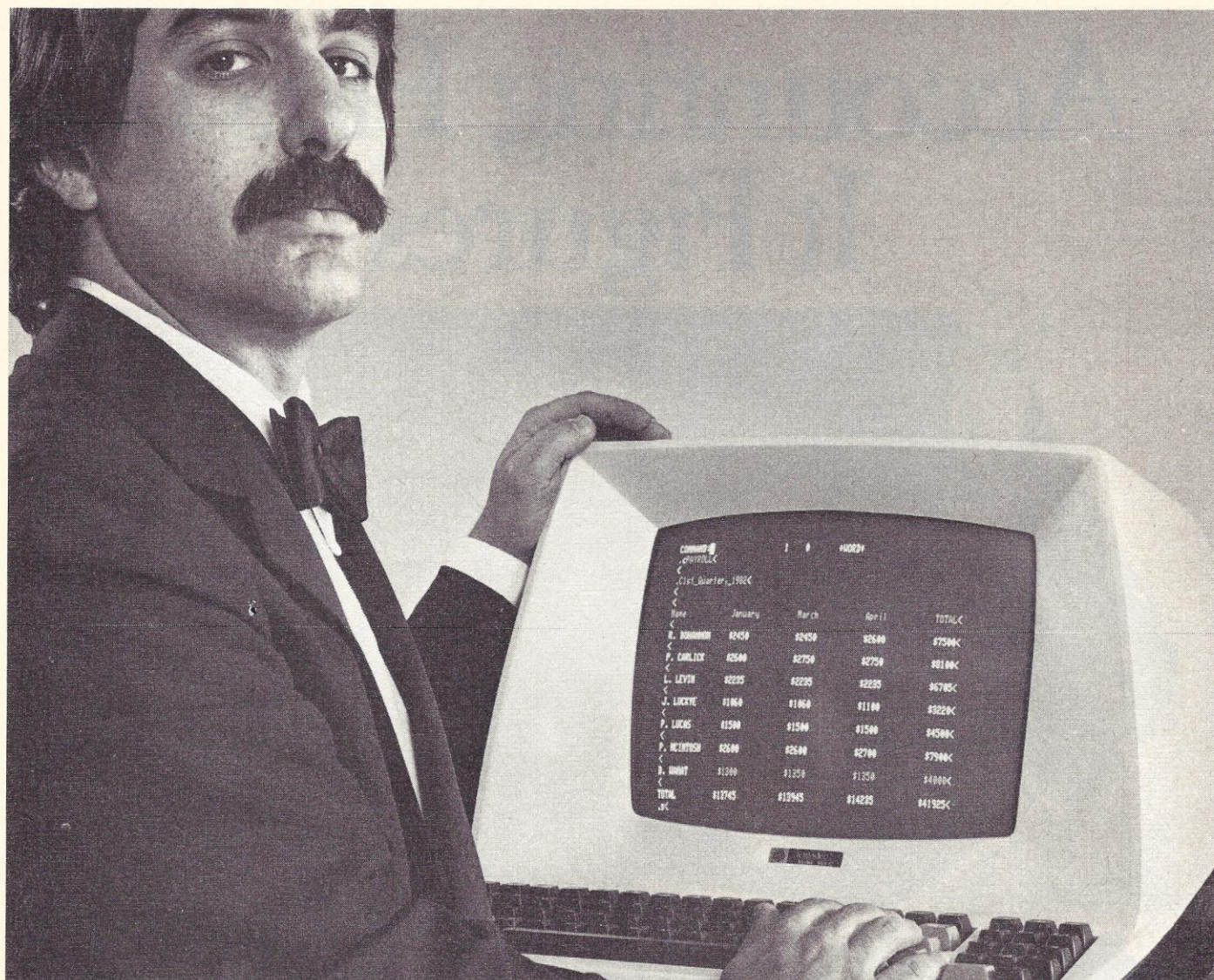
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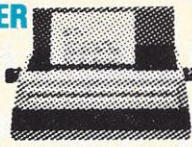
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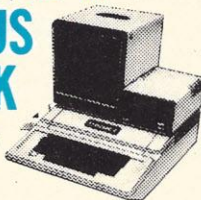


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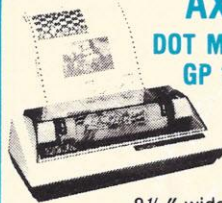
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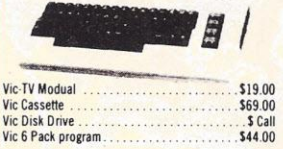
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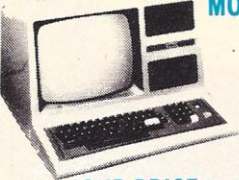
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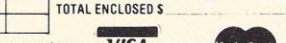
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HARDWARE INDEX

(continued from page 210)

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CR-5500 Monochrome Display
Monitor
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retail
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CR-6500 Color Display Monitor
features a 13-inch in-line color
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graphics and a built-in
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retail
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CR-6600 Color Display Monitor
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composite signals and crisp,
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PRINTERS/PLOTTERS

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either the Apple II or Apple III
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Mountain View, CA 94043
see story on page 206
retail
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DMP-29
eight-pen plotter that features
heightened performance and
firmware attributes
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Bausch & Lomb
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Austin, TX 78761
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	LA120 DECwriter III KSR.	2,295	220	122	83
	LA120 DECwriter III RO.	2,095	200	112	75
	LA12A Portable DECwriter.	2,950	280	155	106
	VT100 CRT DECscope.	1,695	162	90	61
	VT101 CRT DECscope.	1,195	115	67	43
	VT125 CRT Graphics.	3,295	315	185	119
	VT131 CRT DECscope.	1,745	167	93	63
	VT132 CRT DECscope.	1,995	190	106	72
TEXAS INSTRUMENTS	VT18XAC Personal Computer Option	2,395	230	128	86
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	TI765 Bubble Memory Terminal.	2,595	249	138	93
	TI940 CRT.	1,795	173	96	65
	TI785 Portable KSR, 120 CPS.	1,795	173	96	65
	TI787 Portable KSR, 120 CPS.	2,195	211	117	80
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	TI820 KSR Printer.	2,195	211	117	80
	ADM3A CRT Terminal.	595	57	34	22
C-ITOH	ADM5 CRT Terminal.	645	62	36	24
	ADM32 CRT Terminal.	1,165	112	65	42
	CIT-101 CRT.	1,525	147	82	55
TELEVIDEO	CIT-161 Color CRT.	2,675	257	143	97
	CIT-427 Color Graphic CRT.	3,095	297	165	112
	910 CRT Terminal.	650	62	36	24
NEC SPINWRITER	925 CRT Terminal.	850	82	46	31
	950 CRT Terminal.	1,075	103	57	39
	Letter Quality, 7715 RO.	2,695	259	144	98
GENERAL ELECTRIC	Letter Quality, 7725 KSR.	3,195	307	171	115
	2030 KSR Printer 30 CPS.	1,195	115	67	43
	2120 KSR Printer 120 CPS.	2,195	211	117	80
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	MX-100 Printer.	895	86	48	32
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CIRCLE 129

October 1982 PERSONAL COMPUTING

215

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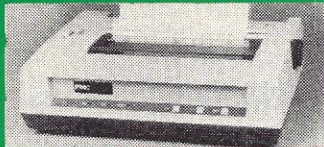
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2 ANNU1	Annuity computation program
3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKVEN	Breakeven analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDDB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMON	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWITH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.
26 ANNUDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDVAL	Value of a bond
30 DEPLETE	Depletion analysis
31 BLACKSH	Black Scholes options analysis
32 STOCVAL1	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDVAL2	Value of a bond
35 EPSEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model i.e. what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EOQ	Economic order quantity inventory model
48 QUEUE1	Single server queueing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPFOT	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQOQOQ	Fixed quantity economic order quantity model
53 FQOQWSH	As above but with shortages permitted
54 FQOQOPB	As above but with quantity price breaks
55 QJUECB	Cost-benefit waiting line analysis
56 NCFANAL	Net cash-flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAPI	Cap. Asset Pr. Model analysis of project
59 WACC	Weighted average cost of capital
60 COMBAL	True rate on loan with compensating bal. required
61 DISCBAL	True rate on discounted loan
62 MERGANAL	Merger analysis computations
63 FINRAT	Financial ratios for a firm
64 NPV	Net present value of project
65 PRINDLAS	Laspeyres price index
66 PRINDPA	Paasche price index
67 SEASIND	Constructs seasonal quantity indices for company
68 TIMETR	Time series analysis linear trend
69 TIMEMOV	Time series analysis moving average trend
70 FUPRINF	Future price estimation with inflation
71 MAILPAC	Mailing list system
72 LETWRT	Letter writing system-links with MAILPAC
73 SORT3	Sorts list of names
74 LABEL1	Shipping label maker
75 LABEL2	Name label maker
76 BUSBUID	DOME business bookkeeping system
77 TIMECLCK	Computes weeks total hours from timeclock info.
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOICE	Generate invoice on screen and print on printer
80 INVENT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TIMUSAN	Time use analysis
83 ASSIGN	Use of assignment algorithm for optimal job assign.
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMSPAY	Compares 3 methods of repayment of loans
86 PAYNET	Computes gross pay required for given net
87 SELLPR	Computes selling price for given after tax amount
88 ARBCOMP	Arbitrage computations
89 DEPRSF	Sinking fund depreciation
90 UPSZONE	Finds UPS zones from zip code
91 ENVELOPE	Types envelope including return address
92 AUTOEXP	Automobile expense analysis
93 INSFILE	Insurance policy file
94 PAYROLL2	In memory payroll system
95 DILANAL	Dilution analysis
96 LOANAFDD	Loan amount a borrower can afford
97 RENTPRCH	Purchase price for rental property
98 SALELEAS	Sale-leaseback analysis
99 RRCONVBD	Investor's rate of return on convertible bond
100 PORTVAL9	Stock market portfolio storage-valuation program

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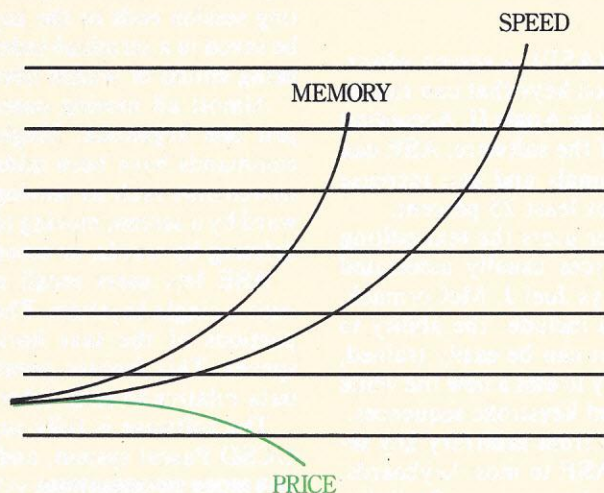
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HAYDEN SOFTWARE

Productivity And Planning Software Debut For Business

Each month Personal Computing scans the software market to keep you up to date on everything that's new. Those products we consider to be most useful and exciting in this month's crop are described in this section and commended for your closer examination. Others are listed in the index.

DEFINE FUNCTION KEYS AND BOOST PRODUCTIVITY

The Advanced System Editor (ASE), a screen editor, provides user-definable function keys that can run on the IBM Personal Computer and the Apple II. According to Volition Systems, developers of the software, ASE can be adapted to a variety of terminals and can increase productivity at the keyboard by at least 25 percent.

"ASE brings personal-computer users the text-editing and program-development resources usually associated with much larger computers," says Joel J. McCormack, the company chairman. Features include the ability to edit large files, function keys that can be easily trained, file selection by a menu, the ability to edit a new file while still within another, and simplified keystroke sequences.

"Because all commands derive from arbitrary key sequences, it is easy to customize ASE to most keyboards, giving manufacturers and systems houses great flexibility in the choice of terminals," McCormack says. Because ASE comes with a separate configuration program, application developers can define the keys they want their users to have. This enables developers to redefine commands or capabilities to fit users' needs and applications.

The Advanced System Editor was designed specifically to improve productivity at the keyboard during program development and text editing. It incorporates user-oriented conveniences not usually found in personal-computer editors. "We included the features found on larger systems that we knew would speed work flow," McCormack says, "and we eliminated bottlenecks and sources of frustration."

The overall result has been to increase the capacity of files that can be edited, automate repetitive tasks, reduce keystrokes, and boost the capabilities of the editor so that memorization is minimized and almost all work can be done without extra manipulation outside the editor.

File handling has been simplified because the file size is limited by available disk space rather than by RAM memory size. With ASE, a single file may fill an entire disk volume, so users are not forced to juggle split files.

User-definable keys allow users to automate tasks that recur within their particular program development or text-editing environment.

Any sequence of keystrokes, including editor commands, can be "taught" to one of eight function keys. Once taught, pressing the function key, in effect, causes the same keystroke sequence to be repeated. The function key remembers the sequence it has learned until the editing session ends or the key is redefined. Definitions can be saved in a terminal-independent fashion within the file being edited or within libraries of definitions.

Almost all moving commands are accomplished with just one keystroke. Single-keystroke cursor-positioning commands have been added to permit additional cursor movements such as moving word by word, moving backward by a screen, moving to the beginning or end of a line, deleting by words, or returning to the home position.

ASE lets users recall search or replacement strings with a single keystroke. The editor also allows for moving portions of the text horizontally (opening or closing space). This feature permits users to move columns of data relative to each other.

The software is fully supported for all versions of the UCSD Pascal system, and costs \$175.

FOR MORE INFORMATION: VOLITION SYSTEMS, P.O. Box 1236, Del Mar, CA 92014; (714) 457-3865.

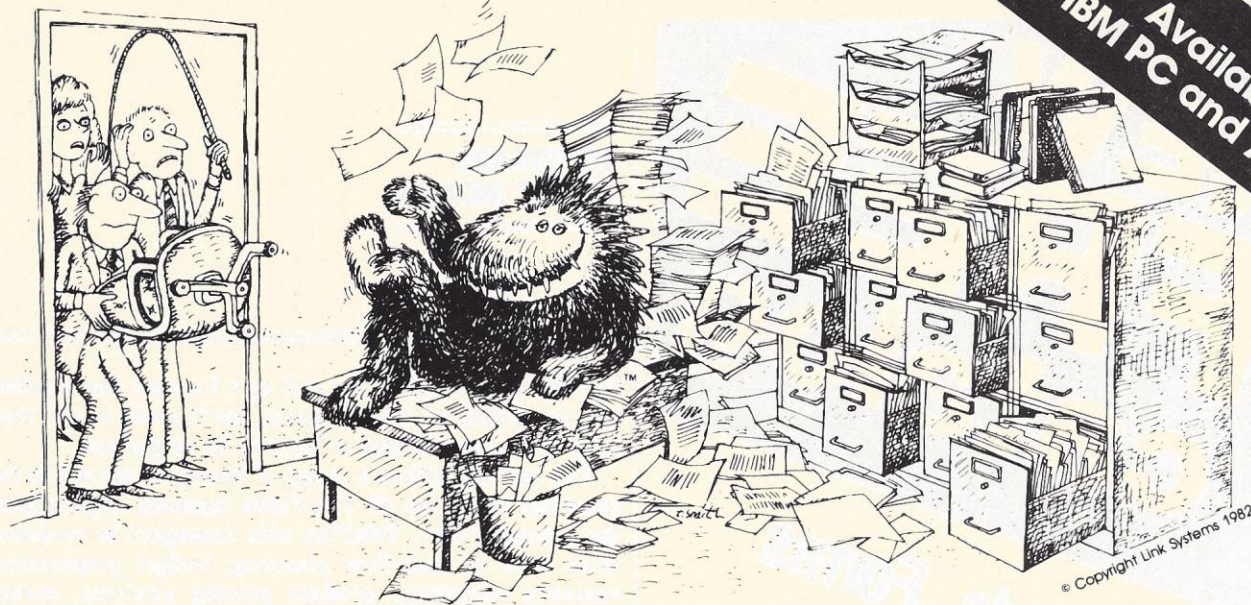
SHARE INFORMATION FOR EXECUTIVE PLANNING

TeleVideo's TelePlan, a financial-modeling tool, helps executives, managers and other professionals in resource planning, forecasting and modeling. It also allows users of TeleVideo's configurable multistation computer systems to share the same financial information simultaneously.

Using TelePlan, several people can prepare individually plans or models, then consolidate all of them into a single document or report. The software is customized for the TeleVideo keyboard, with major functions driven by single-key commands. TelePlan financial modeling software runs on TeleVideo TS-806 six-user and TS-816 16-user computer systems.

"TelePlan is designed from a CPA standpoint, specifically for today's demanding business needs," says Chuck Kempton, vice president of marketing and sales for TeleVideo's Computer Systems Division. "Its multiuser capability makes it unique in the personal-computer world."

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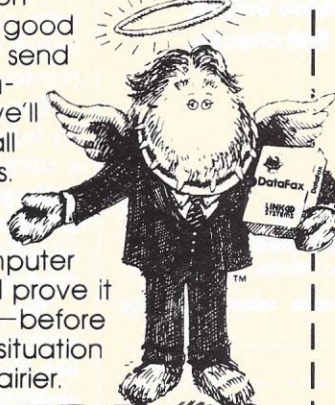
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SOFTWARE OF THE MONTH

For example, one user can call up a forecast that another user is working on, think about it, use it, revise it, and then send it to someone else or back to its originator."

The package offers a range of functions geared to the complete spectrum of TeleVideo business applications, the company says. TelePlan aids managers in modeling tasks such as cash-flow planning, budget preparation, variance reporting, product pricing analysis, manufacturing planning, sales forecasting and capital budgeting. It also offers built-in finance commands, programmability, and sophisticated report generating and formatting capabilities.

"If you've got 10 people working in a marketing department," Kempton says, "and you want to project what will happen if you introduce four new products and sell 'x' of each, one person can assemble a forecast with input and comments from everyone else. TelePlan is ideal for 'group processing.'"

The package costs \$995.

FOR MORE INFORMATION: TELEVIDEO SYSTEMS, INC., 1170 Morse Ave., Sunnyvale, CA 94086; (408) 745-7760.

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The software includes a security password feature for accessing employee information, as well as a special sort key that enables users to group customers, vendors and employees by categories. It features specialized reporting of financial status, receipts, disbursements and accrued employee salary information, and prints both summarized and detailed reports. Unposted and posted versions of some reports can also be generated. Other reports include: trial balance, income statement, balance sheet, aged receivables, revenue analysis, disbursements, and wage withholding registers.

The Business Bookkeeping System runs on an Apple II, Apple II Plus or Apple III with two disk drives and a printer. It costs \$395.

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Quick File III allows for simple arrangement of records in alphabetic, numeric, date or time order, and saves time and effort in producing repetitive reports, calculations, and corrections. Two types of report formats—tables (rows and columns) and labels or index cards—can be created and printed.

The software also allows the user to design forms to meet special needs; allows categories to be added and deleted without retyping previously held information; can selectively search, display, and summarize records; can view many records simultaneously; and can "talk" to Ap-

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SOFTWARE OF THE MONTH

ple Writer III and other ASCII character files.

The program provides these additional reporting advantages: It calculates totals and subtotals of numeric information; contains a calculated column (for percentages, the sum of two other columns, etc.); and allows for the choice of which rows and columns are printed.

Quick File III requires an Apple III system with at least 128k of RAM, and has a suggested retail price of \$100.

FOR MORE INFORMATION: APPLE COMPUTER, INC., 20525 Mariani Ave., Cupertino, CA 95014.

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Denver Software, the product manufacturer.

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A typical use for ROSE would be to create a data base for a customer list. Or, you can use ROSE to generate reminder lists, track and help improve the performance of investments, keep accurate records or maintain a Christmas-card list. You could also use the software to catalog books in your personal or business library, then find what you're looking for by subject, author, title, key word or location.

Each system costs \$349.95 and is designed to operate on an Apple III personal computer.

FOR MORE INFORMATION: THE DENVER SOFTWARE CO., 14100 East Jewell Ave., Suite 15, Aurora, CO 80012; (303) 750-9980.

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PEACHY GRAPHICS LANGUAGE SYSTEM

PGL, short for Peachtree Graphics Language, is an interactive graphics language newly developed for personal computers. Business Graphics System is the first easy-to-use graphics system built with PGL.

Business Graphics System is a menu-driven graphics application program that runs on CP/M-based personal computers. It can be used to develop presentation graphics such as overhead projection transparencies, slides, business charts and graphs and word charts.

The graphics system, which will soon be available in versions for the IBM Personal Computer and CP/M 86, includes an interface to Peachtree's PeachCalc spreadsheet program and PeachText word processor.

PGL is built around a device-independent graphics programming system. Its English-language commands, the company says, make it possible for inexperienced users to begin writing interactive graphics programs quickly.

Peachtree states further that the output from PGL is comparable with that available from large, expensive sys-

tems. PGL can handle both color and black-and-white graphics.

PGL is device-independent for both input and output, and includes two- and three-dimensional graphics transformations. Supported features include pie and bar charts, multiple exploded pie segments, zooming, panning, strip-chart scrolling, multiple independent graphs, rotation and graphic-arts quality annotation. PGL can be used to display high-precision text in seven different fonts, and it can do polygon filling on both plotters and soft-copy devices.

For input, PGL supports popular digitizers, light pens, cursor keys and joysticks. These can be used to select from menus, define polygons and paint pictures.

Standard device drivers (subprograms that let computers interface with classes of peripherals) included with the program support the Hewlett-Packard HP-GL series plotters, Epson printers (MX-80 and 100), Summagraphics BitPad One digitizers and any PLOT 10 (a graphics language from Tektronix) compatible CRT.

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FOR MORE INFORMATION: PEACHTREE SOFTWARE, 3445 Peachtree Rd. N.E., Atlanta, GA 30326; (404) 239-3000.

WHEN SPELLING COUNTS

The Sensible Speller, a spelling verification program for the Apple II personal computer, features the complete Concise Edition of the Random House Dictionary.

Five versions of the Sensible Speller are available. There is no need to muffle or transfer your files from one operating system to another. The DOS 3.3 version works with Apple Writer I or II, Apple Pie, The Correspondent, Executive Secretary, Letter Perfect, Magic Window, Screenwriter II, Text Editor, TXT/ED, Write-On, Word Power, Pie Writer and other word processors that generate standard DOS 3.3 text or binary files. There are also versions for Super Text, Super Text II, Super Text 40/80, Word Handler II, CP/M-based systems and Pascal.

The Sensible Speller requires an Apple II or Apple II Plus equipped with 48k, DOS 3.3 and one or two disk drives. Two disk drives are needed to delete from or add words to the dictionary. The price is \$125.

FOR MORE INFORMATION: SENSIBLE SOFTWARE, 6619 Perham Dr. West Bloomfield, MI 48033; (313) 399-8877.

EASY WORD PROCESSING FOR HARRIED PROFESSIONALS

Kensington Microware Ltd.'s Format-II is a word processor designed for use in professional office environments. The product offers significant advantages over previous word processing offerings for the Apple II, the company says.

Format-II is a machine code, core-resident program. Once booted there is no further need to access the program disk, and both disk drives become available for text. It also does away with confusing CTRL functions. All editing and formatting commands are accessed with single key strokes. To center a block of text, touch "C"; to delete, touch "D"; justify, touch "J", and so on.

The program comes with a built-in mailing list. Users are provided with records up to 16 fields (lines) long and 450 records fit on each mailing list disk. Users can perform alphanumeric sorts and string eight of 16 fields within complicated logic.

Format-II supports all Apple II compatible printers. It requires an Apple II Plus with an 80-column card and 48k or 64k of RAM. Suggested retail price is \$375.

FOR MORE INFORMATION: KENSINGTON MICROWARE LTD., 300 East 54 St., New York, NY 10022; (212) 490-7691.

A NEAT LITTLE PACKAGE DELIVERS MAIL

The Mail Monitor, an electronic-mail software package, allows local area network users to send letters or data to each other on the Apple II and Corvus Concept computers. An optional version that supports a modem

allows information to be transmitted over telephone lines to distant networks.

The Mail Monitor contains two programs: the central control Post Office program, which runs on a dedicated Apple II computer; and the Mail Box program, which runs on each user's computer on the network. The Post Office program acts as the main distribution center for all mail. The local Mail Box program is run by the user to create and send letters to the post office for distribution to other user locations and to access mail deposited at the post office.

One letter can be addressed to specific locations or to a general distribution list. Senders are notified when any letter has been received by everyone on the address list. Data or text files can be sent along with a letter.

Two versions of the Mail Monitor are available. One for local networks only and one with software support for a modem for communication with distant networks. Either version allows attachment of up to 64 Apple II workstations on a local network. Suggested retail price of the local area network Mail Monitor, including Apple II Post Office and Apple II Mail Box, is \$495. The Mail Monitor with modem support is priced at \$750.

Although the central post office must be an Apple II, an optional diskette priced at \$200 allows Corvus Concept workstations to be attached to the local area network as any of the 64 workstations.

FOR MORE INFORMATION: SOFTWARE CONNECTIONS, 1800 Wyatt Dr., Suite 17, Santa Clara, CA 95054; (408) 988-3704.

SOFTWARE FOR WORLD VIDEOTEX SERVICE

Logica's new Appletel Disk allows Apple computer users to plug into the Prestel World Videotex Service. The software turns the personal computer into a terminal to retrieve a wide range of international data.

The user can access regularly updated prices of 63 commodities from exchanges in the U.S., Europe and the Far East; 64 currency exchange and IMM rates; and 713 U.K. and other stocks. Many other data bases are also available including: financial management information on worldwide corporate sectors; economic indicators and statistics on most industrialized countries; locations of 22,000 deep-sea ships "bound for" or "in port"; bookings at over 400 hotels in the U.K. and elsewhere; airline schedules of over 50 carriers with reservation facilities on major airlines; electronic messaging to other Prestel users; and international news, sports and weather.

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FOR MORE INFORMATION: LOGICA/BVT, 666 Third Ave., New York, NY 10017; (212) 599-0828. 

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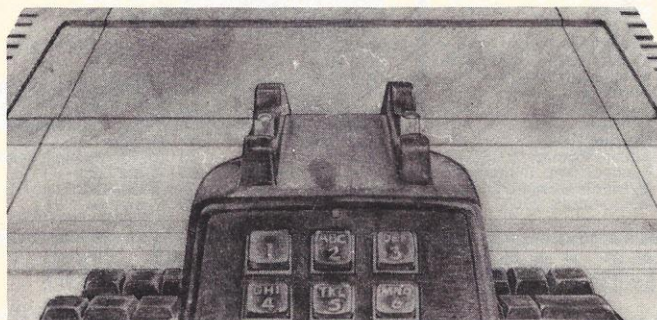
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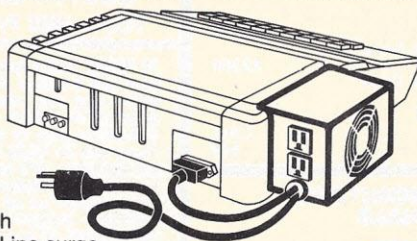


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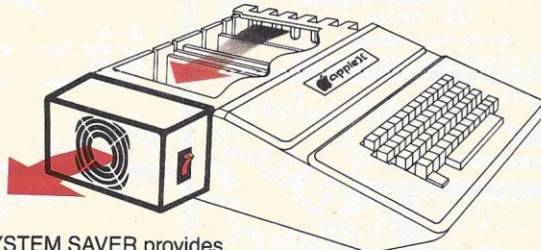
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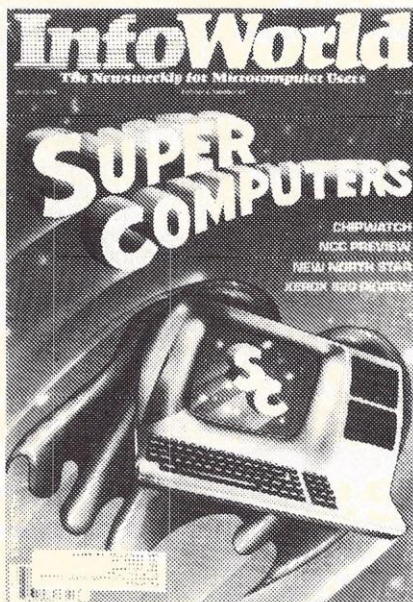
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T.I.M. has all of the features one has come to expect from a data management package, as well as many new ones. For example, a *word processing* interface that allows you to merge information from a T.I.M. file with letters or other documents created by a word processor. Now you can automatically send personalized letters to hundreds or thousands—quickly and easily. T.I.M.'s *Select* command enables you to pull specific information from a file. For example, "All customers who live in a certain ZIP code, whose last name begins with the letter A to L, whose balance due is less than \$50.00." A sophisticated *report generator* and even a *list generator* are also included.

How powerful is T.I.M.? With a maximum record size of 2400 characters and the ability to keep up to forty fields sorted properly at all times, T.I.M. is powerful enough to handle just about any application. T.I.M. can handle over 32,000 records per file, and two files can be linked together for reports if your application requires a many-to-one relationship. T.I.M. also includes all of the same editing commands as your word processor, thus making data entry and

editing a snap. You can also pull selected records from one file to place them into another. Files may be restructured to add or subtract fields and/or change field lengths or types. T.I.M. even has its own utility for backing up hard disks onto floppies.

The Manual

Many people believe that the manual is just as important as the software itself, a view that we at Innovative Software, Inc. tend to share. The manual for T.I.M. is divided into two sections, the Reference section and the Primer. The Reference section describes all of T.I.M.'s commands and subcommands. This is done in English, not in technical terms or in our own language. Even if you have never seen a computer before in your life, you'll be able to read and understand our manual immediately. The second section is a primer which goes through several examples for you, again in plain English. These true-to-life examples take the beginner by the hand, and instruct him what to do and when. You will be able to see for yourself that T.I.M.'s only limitation is the imagination of the user.

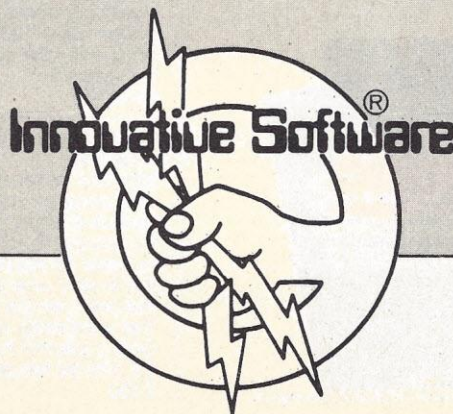
Where to Find T.I.M.

T.I.M. is available from many fine computer dealers across the country. Or you may purchase from us direct by calling 913/383-1089. Either way you will have the finest data management program available.

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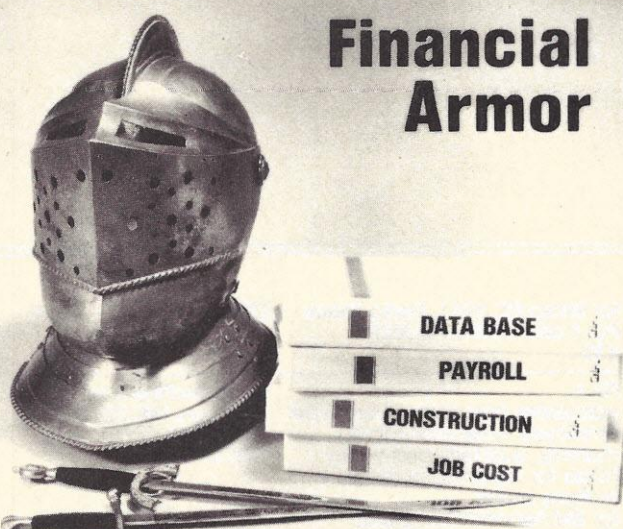
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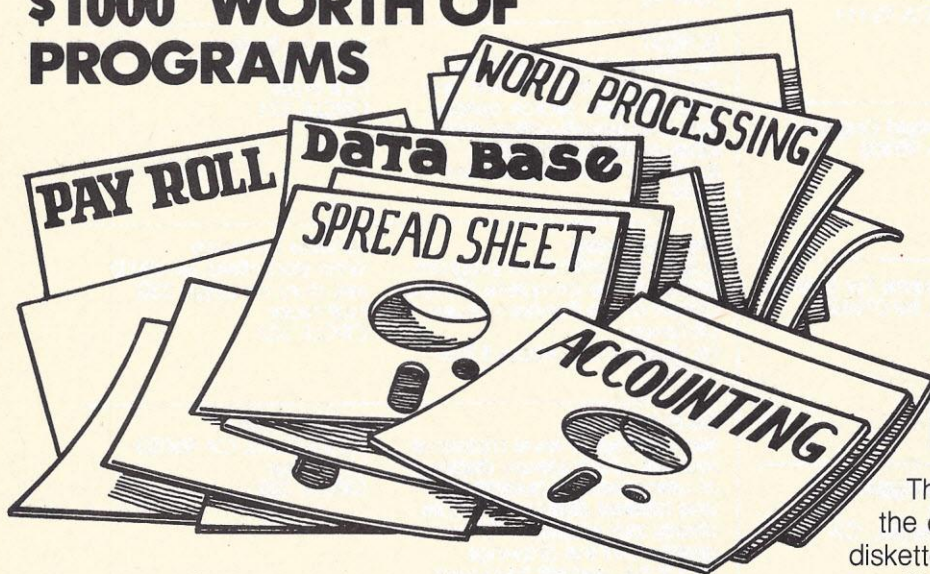
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(continued on page 244)

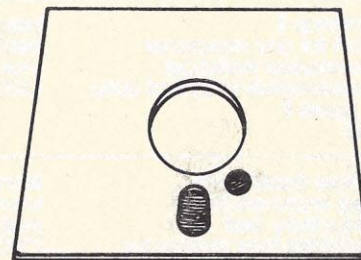
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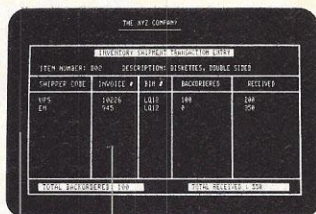
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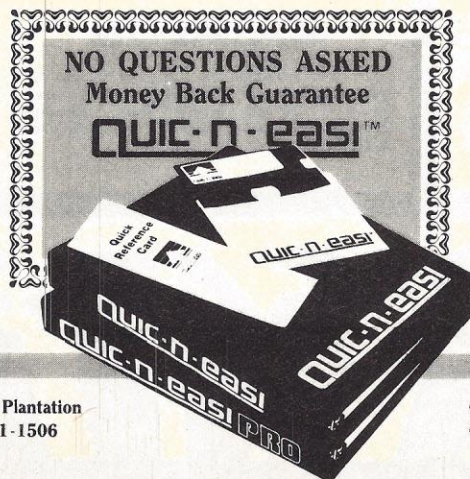
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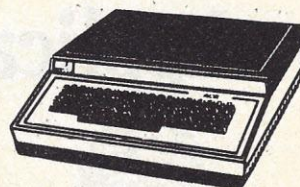
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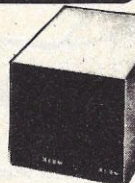
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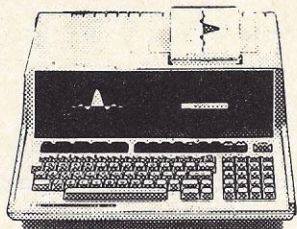
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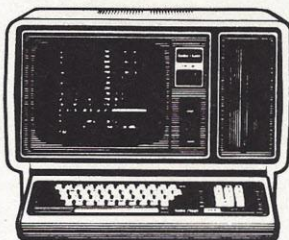
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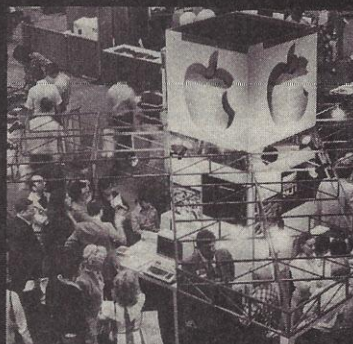
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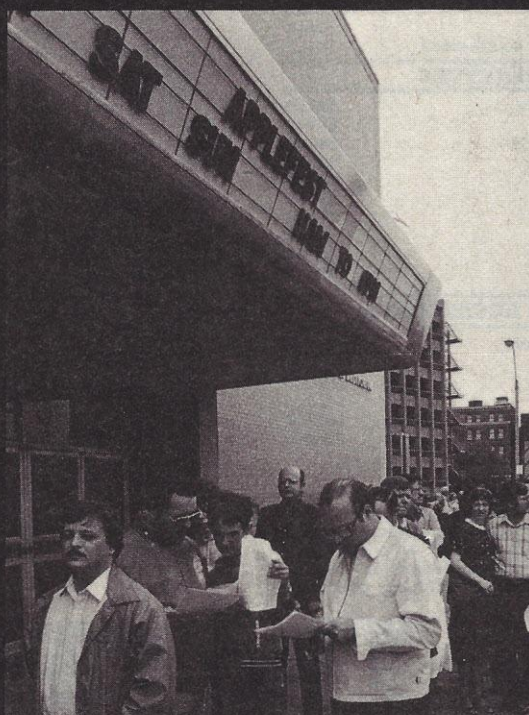
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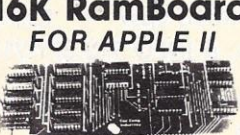
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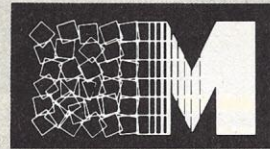
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Model	Name	Mfr. Sugg. Ret.	Elek-Tek Price	Model	Name	Mfr. Sugg. Ret.	Elek-Tek Price
CONSOLE							
PHC 004A	TI-994A Home Computer (incl. RF Modulator)	525.00	300.00				
PERIPHERALS							
PHP 1200	Peripheral Expansion Box	249.95	180.00				
PHP 1220	RS-232 Card	174.95	130.00				
PHP 1240	Disk Controller Card (One Disk Manager module packed with each Disk Controller)	249.95	180.00				
PHP 1250	Expansion System Disk Drive (Disk Drive Controller required)	399.95	285.00				
PHP 1260	Memory Expansion Card (32K RAM)	299.95	215.00				
PHP 1270	P-Code Card (32K RAM Memory Expansion required)	249.95	180.00				
PHP 1500	Solid State Speech™ Synthesizer	149.95	110.00				
PHP 1600	Telephone Coupler (Modem)	224.95	163.00				
PHP 2500	TI 80 Column Impact Printer	750.00	580.00				
PHP 2300	VCR Controller	299.95	200.00				
PHP 2400	P.F. Modulator (TV Adapter)	49.95	35.00				
PHA 2100	10" Color Monitor	399.95	320.00				
PHA 4100	10" Color Monitor	399.95	320.00				
OPTIONAL ACCESSORIES							
PHP 1100	Wired Remote Controllers (Pair)	34.95	28.00				
PHA 1850	Thermal Paper (2 Pack)	9.95	8.00				
PHA 2000	Dual Cassette Cable	14.95	12.00				
PHA 2010	Monitor Cable	19.95	15.00				
PHA 2020	Audio Adapter (Headphone Jack)	19.95	15.00				
PHA 2310	Panasonic VCR Controller Cables	99.95	85.00				
PHA 2320	Sony Video Controller Cables	99.95	85.00				
PHA 2330	Pioneer Video Controller Cables	99.95	85.00				
APPLICATION PROGRAMS							
Home Management/Personal Finance							
PHM 3008	Home Financial Decisions	29.95	24.00				
PHM 3007	Household Budget Management (Data storage system is required)	39.95	32.00				
PHM 3012	Securities Analysis	54.95	44.00				
PHM 3013	Personal Record Keeping (Data storage system is recommended)	49.95	40.00				
PHM 3016	Tax/Investment Record Keeping (Disk system is recommended)	69.95	56.00				
PHM 3022	Personal Real Estate (Data storage system is recommended)	69.95	56.00				
PHM 3044	Personal Report Generator (Data storage system is recommended)	49.95	40.00				
PHM 3111	TI Writer (32K Memory Expansion required)	99.95	75.00				
PHM 3113	Microsoft™ Multiplan™ (32K Memory Expansion required)	99.95	75.00				
PHD 5001	Diskette	69.95	56.00				
PHD 5003	Mailing List	19.95	16.00				
PHD 5021	Personal Financial Aids	19.95	16.00				
PHD 5022	Checkbook Manager	19.95	16.00				
PHD 5024	Business Aids Library—Finance Management (Extended BASIC Command Module is required)	39.95	32.00				
PHD 5027	Business Aids Library—Inventory Management (Personal Record Keeping or Statistics Command Module is required)	69.95	56.00				
PHD 5028	Business Aids Library—Lease/Purchase Decisions (Personal Record Keeping or Statistics Command Module is required)	69.95	56.00				
PHD 5029	Business Aids Library—Cash Management (Extended BASIC Command Module is required)	39.95	32.00				
PHD 5038	Business Aids Library—Lease/Purchase Decisions (Extended BASIC Command Module is required)	69.95	56.00				
PHD 6003	Cassette	14.95	12.00				
PHD 6038	Personal Financial Aids	59.95	45.00				
PHD 6038	Business Aids Library—Lease/Purchase Decisions	59.95	45.00				
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PHM 3004	Number Magic	19.95	16.00				
PHM 3005	Video Graphs	19.95	16.00				
PHM 3008	Video Chess	19.95	16.00				
PHM 3010	Physical Fitness	29.95	24.00				
PHM 3020	Music Maker (Data storage system is recommended)	39.95	32.00				
PHM 3021	Weight Control and Nutrition (Data storage system is recommended)	59.95	48.00				
PHM 3040	TI LOGO (Memory Expansion required)	129.95	75.00				
PHM 3064	Touch Typing Tutor* (Available for TI-99/4A only)	39.95	32.00				
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(continued on page 258)



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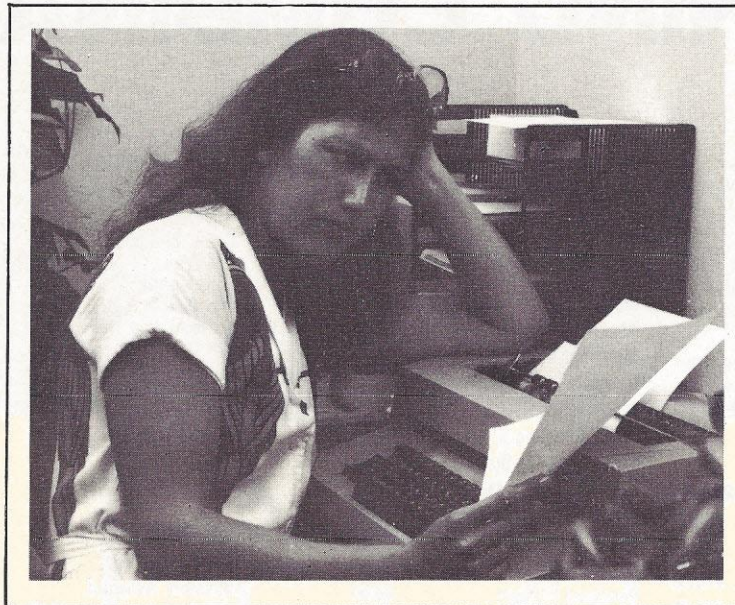
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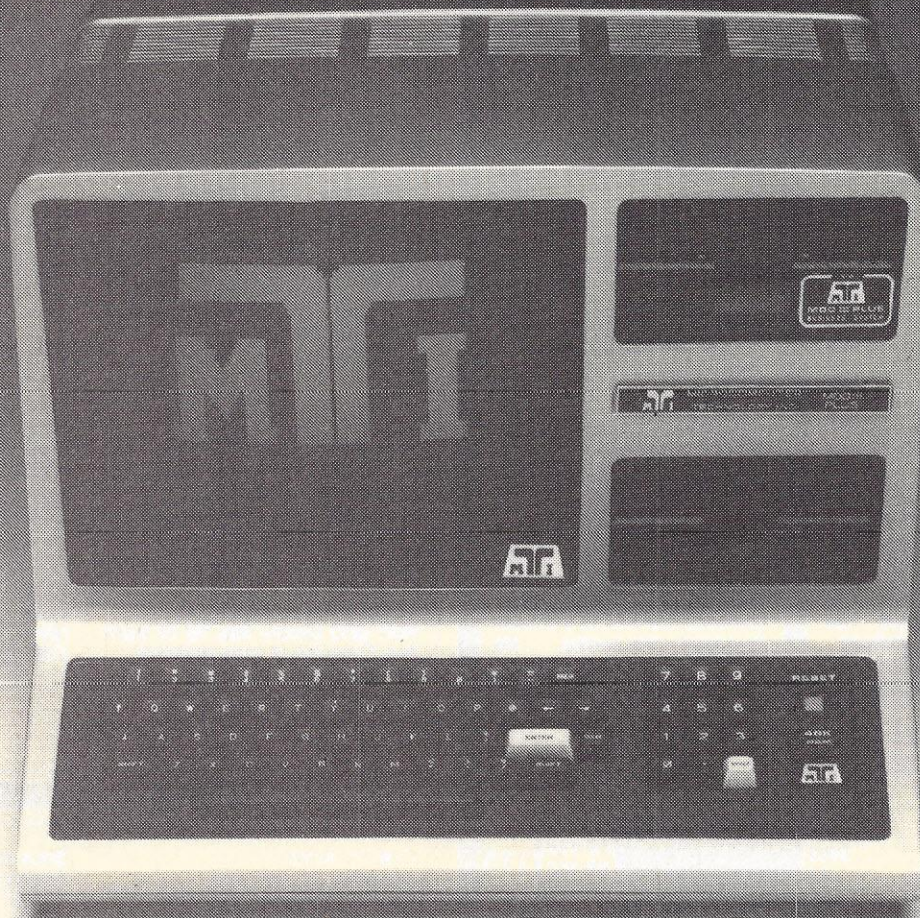
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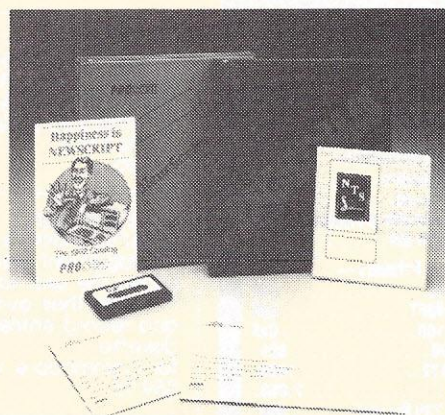


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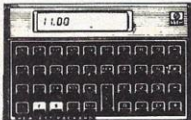
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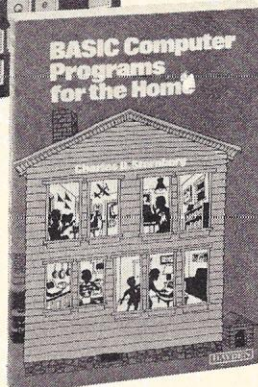
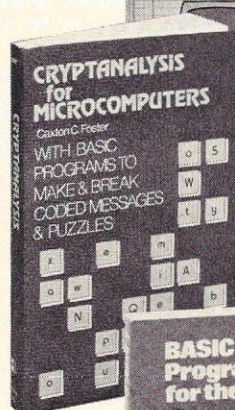
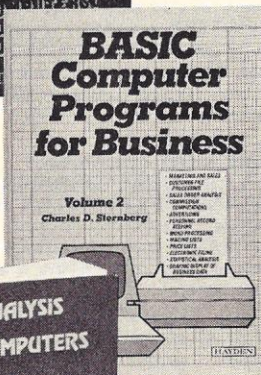
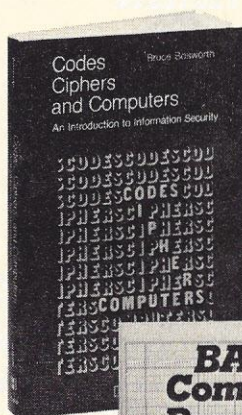
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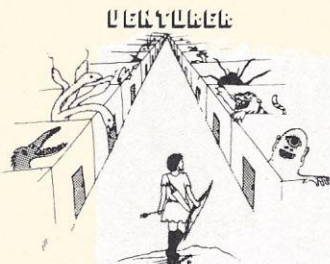
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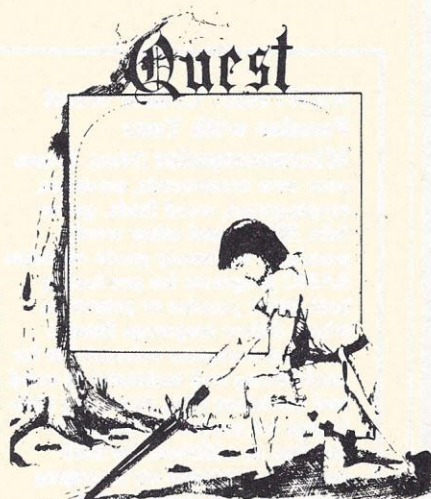
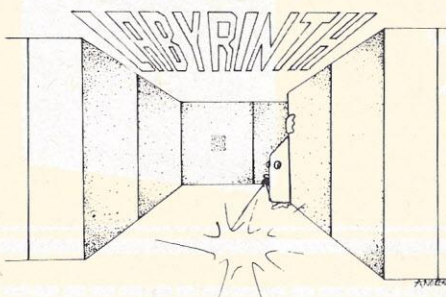
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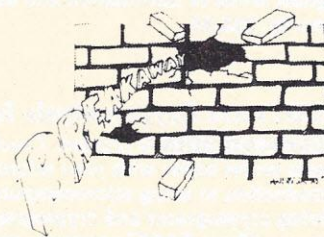
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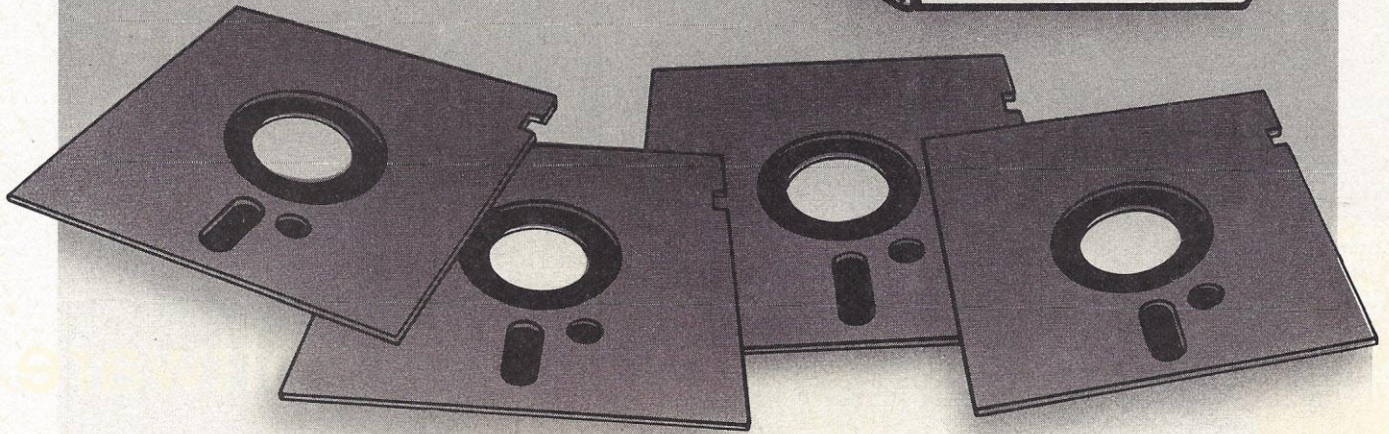
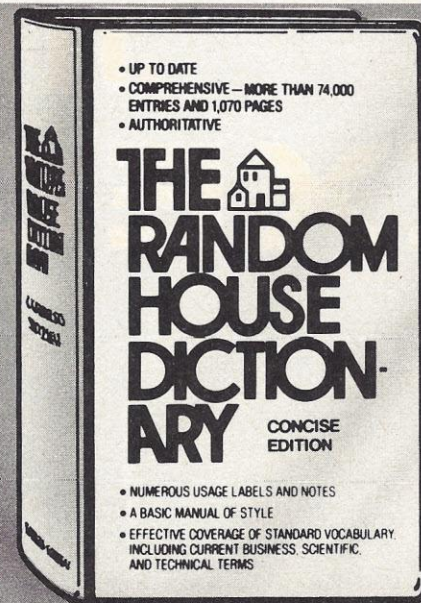
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Evans Business Computer Sys (209) 576-0451
A I Personal Computer/Longwood (305) 339-8914
Allstate Business Center Ltd./Miami (305) 665-1013
Baron Electronic Sales/Hialeah Gardens (305) 556-1300
Byte Shop of Miami (305) 264-2983
Clarks Out of Town News/Ft. Lauderdale (305) 467-1543
Computer Ctr./Palm Beaches (305) 689-3233
Computer Image/Miami (305) 271-1224
Computer Scene/Miami (305) 945-1014
Computer Scene/N. Miami Beach (305) 238-7238
Computerland (305) 862-6202
Computerland/Boca Raton (305) 368-1122
Computerland/Ft. Lauderdale (305) 566-0776
Computerland/W. Palm Beach (305) 684-3338
Electronic Equipment Co./Miami (305) 871-3500
H.I.S. Computeration/Melbourne (305) 254-9399
Lighthouse Book Store/Lighthouse Pt. (305) 781-1945
Micro Age Computer Store/W. Palm Beach (305) 683-5779
Programs Unlimited/W. Palm Beach (305) 689-1200
Sunnys At Sunset, Inc./Sunrise (305) 741-2070
The Xerox Store/Altamonte Springs (305) 831-3100
The Xerox Store/Ft. Lauderdale (305) 524-4663
The Xerox Store/Miami (305) 667-5441
The Xerox Store/N. Miami Beach (305) 947-9346
The Xerox Store/Orlando (305) 898-5000
The Computer Chip/Bradenton (813) 792-2188
Computerland/Clearwater (813) 785-5579
Computerland/Seminole (813) 392-0771
Computerland/Tampa (813) 971-1680
Computerland of Lakeland (813) 644-6437
Computers Etc./Lakeland (813) 683-3933
Extra Extra Newstand/Tampa (813) 886-1802
H & H Hobby Sales/Sarasota (813) 922-7711
Henry's News Stand (813) 536-3863
Micro Computer System Inc. (813) 879-4301
New World Computer/Bradenton (813) 748-5485
Poling Place/Pinellas Park (813) 541-2729
The Xerox Store/Clearwater (813) 796-7507
The Xerox Store/Tampa (813) 977-8301
The Xerox Store/Tampa (813) 876-7439
Computer Store/Gulf Breeze (904) 932-0660
Computer Sys. Resource (904) 376-4276
Computerland/Jacksonville (904) 731-2471
Computerland/Tallahassee (904) 224-9341
Florida Book Store/Gainesville (904) 376-0666
Goerings Book Ctr./Gainesville (904) 378-0363
Grice Electrs. Inc./Pensacola (904) 477-8100
Vitech/Tallahassee (904) 893-1743

PERSONAL COMPUTING DEALERS

GEORGIA

Atlanta Computer Mart/Atlanta (404) 455-0647
 Baileys Computer Shop (404) 790-5771
 Competitive Edge, Inc./Peachtree City (404) 487-6460
 Computerland/Atlanta/Smyrna (404) 953-0406
 Guild News Agency/Atlanta (404) 252-4166
 Micro-Graphics Systems, Inc./Augusta (404) 790-5771
 The Xerox Store/Atlanta (404) 938-1276
 The Xerox Store/Atlanta (404) 233-9025
 The Xerox Store/Smyrna (404) 952-3901
 Computer Gazebo/Savannah (912) 232-8888
 Electronics 21 Inc./Savannah (912) 352-0585
 Grey Communications Cons./Albany (912) 883-2121

HAWAII

Amtec Inc./Honolulu (808) 955-7429
 Computer Center/Pearl City (808) 448-2171
 Computerland/Hawaii/Honolulu (808) 521-8002
 Radio Shack No. 7086/Aiea (808) 487-1509

IDAHO

Computer Co. Inc./Boise (208) 375-9381
 Electronic Specialties/Boise (208) 376-5040
 Northwest Computer Ctr./Boise (208) 375-6681

ILLINOIS

Byte Shop/Champaign (217) 352-2323
 Computerland/Champaign (217) 359-0895
 Computer-Ease/Macomb (309) 833-3886
 Wallace Micro-Mart Inc./Peoria (309) 685-7876
 ABC Byte Shop/Skokie (312) 673-3550
 Book Market/Chicago (312) 944-3358
 Book Market/Chicago (312) 440-4475
 Byte Shop/LaGrange (312) 579-0920
 Complete Computing/Lombard (312) 620-0808
 Compshop/Rolling Meadows (312) 593-1800
 Computerland (312) 949-1300
 Computerland (312) 967-1714
 Computerland/Naperville (312) 369-3511
 Computerland/Northbrook (312) 272-4703
 Computerland/Oak Lawn (312) 422-8080
 Computerland/Oak Park (312) 383-1606
 Computerland/Schaumburg (312) 253-3009
 Computerland of St. Charles (312) 377-7200
 Data Domain/Schaumburg (312) 397-8700
 Erickson Communication/Chicago (312) 631-5181
 Illinois Microcomputer/Naperville (312) 420-8813
 Kroch's & Brentano's/All stores (312) 332-7500
 Micro Computer Ctr./Geneva (312) 232-1545
 Nabih's Inc./Evanston (312) 869-6140
 Northbrook Computers (312) 480-9190
 Oak Brook Computer Ctr. (312) 941-9005
 Page One/Roselle (312) 529-9060
 Prairie News Agency/Chicago (312) 384-5350
 Sorbus Station/Bensenville (312) 459-8560
 The Book Store/Arlington Hgts. (312) 255-8040
 Wine Micro Computers (312) 420-8813
 Univ. Bookstore/Carbondale (618) 536-3321
 Alpine Computer Ctr./Rockford (815) 229-0200
 Appletree Computer/DeKalb (815) 758-8666
 Computer Store/Rockford (815) 962-7580
 Computerland/Joliet (815) 741-3303

INDIANA

Computer Plus (219) 865-3930
 Computerland/Ft. Wayne (219) 483-8107
 Computerland/Mirabel (219) 769-8120
 Computerland/Mishawaka (219) 256-5688
 Data Base/Ft. Wayne (219) 484-3164
 Computercraft/Carmel (317) 846-5996
 Computerland/Anderson (317) 649-1122
 Graham Electrs./Indianapolis (317) 634-8202
 Data Domain/Bloomington (812) 334-3607
 Hoosier Electrs./Terre Haute (812) 232-8508

IOWA

Computer Country, Inc./Marion (319) 377-9437
 Memory Bank/Bettendorf (319)
 386-3330/Memory Bank/Clinton (319) 242-2755
 The Partstore/ Marion (319) 373-1803

KANSAS

Amateur Radio Equip./Wichita (316) 264-9166
 Computerland/Hutchinson (316) 662-6832
 Computerland/Wichita (316) 684-3870
 High Technology/Wichita (316) 262-0315
 Book Shop/Manhattan (913) 537-8025
 Computerland (913) 492-8882
 Computerland/Lawrence (913) 841-8611
 Computerland/Topeka (913) 267-6530
 Online Computer Centers/Overland Pk. (913) 341-6651
 Personal Computer Ctr./Overland Pk. (913) 649-5942
 The Computer Room/Beatty (913) 341-3500

KENTUCKY

Computer Emporium/Louisville (502) 589-9482
 Heathkit Electr./Louisville (502) 245-7811

Computer Place/Lexington (606) 276-3594
 Computer World/Ashland (606) 329-0545
 MicroAge Computer Store/Lexington (606) 278-0304

LOUISIANA

Computer Shoppe Inc./Metairie (504) 454-6600

MAINE

Coastal Computer Center/Brunswick (207) 729-0298
 Retail Computer Ctr./Elsworth (207) 669-6736

MARYLAND

Balance Corp. Center Inc./Baltimore (301) 625-1100
 Bethesda Computers (301) 657-1982
 Chafitz/Rockville (301) 340-3300
 The Comm. Center/Laurel (301) 782-0600
 Computer Strategies Inc./Gaithersburg (301) 840-2173
 Computer Unlimited/Towson (301) 321-1553
 Computers Etc./Annapolis (301) 268-5801
 Computerland (301) 340-8484
 Computerland/Towson (301) 337-5555
 Fredericks Computer Products/Frederick (301) 684-8884
 Heathkit Electrs. (301) 881-5420
 Komar Ltd./Baltimore (301) 675-2200
 Logical Choice/Ellicott City (301) 465-3175
 Program Store/Baltimore (301) 944-0200
 Radio Shack/Annapolis (301) 224-2900
 The Xerox Store/Rockville (301) 424-1450

MASSACHUSETTS

Computer Source/Pittsfield (413) 443-7181
 Retail Computer Ctr./Ludlow (413) 589-0106
 Computer City (617) 755-5464
 Computer City (617) 875-8126
 Computer City (617) 273-3146
 Computer City (617) 242-3350
 Computer City (617) 826-9217
 Computer City (617) 774-7118
 Computer Store/Sudbury (617) 232-5470
 Computer Store/Cambridge (617) 354-4599
 Computerland/Boston (617) 235-6652
 Computerland/Boston (617) 482-6033
 Eden Microcomputers/Osterville (617) 428-3515
 The Game Shop/Acton (617) 263-0418
 Harvest Computer/Cambridge (617) 547-3289
 Heathkit Electrs./Wellesley (617) 237-1510
 Land of Electronics/Saugus (617) 581-3133
 New England Electronics CO/Needham (617) 449-1765
 Ni-Ni's Corner, Inc./Cambridge (617) 547-3558
 Out of Town News/Cambridge (617) 354-7777
 Palace Spa/Brighton (617) 783-5858
 Retail Computer Ctr. (617) 935-8060
 Small Business Group/Westford (617) 692-3800
 Video Station/Woburn (617) 933-1445
 YDI Electrs./Needham (617) 449-1005
 The Xerox Store/Boston (617) 451-5800
 The Xerox Store/Burlington (617) 273-5665
 The Xerox Store/Chestnut Hill (617) 566-1707

MICHIGAN

Binary Corp/Berkley (313) 548-0533
 Community News Center (313) 662-6150
 Computer Center/W. Bloomfield (313) 422-2570
 Computer Connection/Farmington Hills (313) 447-4470
 Computer Contact, Inc./Grand Blanc (313) 694-3704
 Computer Horizons (313) 464-6502
 Computer Mart (313) 649-0910
 Computer Mart/Flint (313) 234-0161
 Computerland (313) 973-7075
 Computerland/Southfield (313) 356-8111
 The Family Computer Center/Berkley (313) 546-8114
 Front Page Bookstore/Pontiac (313) 332-3431
 Heathkit Electr./Detroit (313) 772-0416
 Heathkit Electr. Ctr./Detroit (313) 535-6480
 Metro News #2/Birmingham (313) 851-7121
 New Horizons Book Shop/Roseville (313) 296-1560
 Rainbow Computers/Troy (313) 528-3535
 Rochester Book Center (313) 651-0199
 Simtec/Birmingham (313) 855-3990
 Spectrum Computers/Lathrup Village (313) 559-5252
 Community Newscenter (517) 694-0490
 Community Newscenter (517) 349-3510
 Computer Mart/Lansing (517) 351-1777
 Computerland/Grand Rapids (616) 942-2931
 Computers & More/Grand Rapids (616) 243-3525
 Professional Data Corp./Marquette (906) 228-2626

MINNESOTA

Granada News/Duluth (218) 727-9122
 Readmore Book & Card/Mankato (507) 345-5704
 Apple A Day/St. Paul (612) 293-9062
 Computer Depot/Bloomington (612) 375-2008
 Computer Professionals/Burnsville (612) 435-8060
 Computerland (612) 559-1984
 Digital Den/St. Paul (612) 699-8442
 Micro Age Computer Store/Minneapolis (612) 338-1777

Minnesota Book Center/Minneapolis (612) 373-5734
 Personal Business Systems/Minneapolis (612) 929-4120
 Readmore Bookstore/Minneapolis (612) 333-3628
 Schindler's Hennepin News/Minneapolis (612) 333-6942
 Shinder Book & News/St. Paul (612) 227-0899
 The Xerox Store/Edina (612) 929-4334
 The Xerox Store/Minneapolis (612) 332-6866
 The Xerox Store/St. Paul (612) 227-3366

MISSISSIPPI

The Book Store/Greenville (601) 332-2665
 Computerland/Jackson (601) 362-8755
 Miss-Lou Computer Center/Natchez (601) 442-2836
 Southeastern Aud. Vis./Starkville (601) 324-0797

MISSOURI

Computer Center/St. Louis (314) 444-3111
 Computer Country-North (314) 921-5644
 Computerland/St. Louis (314) 567-3291
 Famous-Barr Computer Ctr./St. Louis (314) 241-5469
 Gateway Electrs/St. Louis (314) 427-6116
 Micro-Age Computer Ctr./St. Louis (314) 567-7644
 Computer Mart/Springfield (417) 862-6500
 House of Computers/Joplin (417) 782-0880
 Computerland (816) 436-3737
 Computerland (816) 364-4498
 Computerland/Independence (816) 461-6502

MONTANA

Computerland/Billings (406) 259-0565
 Computerland/Great Falls (406) 767-8700
 Consolidated Services/Amissonia (406) 721-1811
 Prairie Computers/Great Falls (406) 727-6992

NEBRASKA

Computerland/Omaha (402) 391-6716
 Electronic Center/Lincoln (402) 476-7331

NEVADA

Computerland/Las Vegas (702) 369-2001
 Home Computers/Las Vegas (702) 736-6363
 PCS Computer Service/Las Vegas (702) 870-4138

NEW HAMPSHIRE

Bitznbytes/Concord (603) 224-8233
 Computer City (603) 898-2390
 Computer City (603) 668-9527
 Computerland/Nashua (603) 889-5238
 Computer Mart (603) 883-2386
 Computer Town/Salem (603) 893-8812
 Strictly Software/Hudson (603) 883-5005

NEW JERSEY

Apple Cor/Basking Ridge (201) 766-3977
 Computer Corner (201) 835-7080
 Computer Dimensions/Westfield (201) 232-8300
 Computerland (201) 845-9303
 Computerland/Eatontown (201) 389-2333
 Computerland/Morristown (201) 539-4077
 Computer Mart of New Jersey/E. Hanover (201) 428-0200
 Computer Mart of New Jersey/Green Brook (201) 752-6300
 Computer Mart of New Jersey/Iselin (201) 283-0600
 Computer Nook/Pine Brook (201) 575-9468
 Computer Technicians/E. Brunswick (201) 238-2780
 Computer Universe/Paramus (201) 262-0960
 Earth Rise Micro Sys./Madison (201) 822-0518
 Heathkit Electr. Ctr./Fairlawn (201) 791-6935
 Lloyd's Computers/Ridgewood (201) 445-8801
 Software City/Teaneck (201) 692-8317
 Stonehenge Computer/Summit (201) 277-1020
 The Computer Center, Inc./Montvale (201) 391-1006
 Bargain Brothers/Trenton (609) 883-2050
 Computer Encounter/Princeton (609) 924-8757
 Computer Mart of New Jersey/Lawrenceville (609) 452-1858
 The Computer Port/Northfield (609) 641-4300
 Computer Workshop/Cherry Hill (609) 665-4404
 Computerland/Cherry Hill (609) 795-5900
 Personal Computing (609) 927-3880
 Radio Shack/Moorestown (609) 244-7494
 Radio Shack/Toms River (609) 234-2666
 Sorbus Station (609) 662-0997

NEW MEXICO

Computer Shop/Clovis (505) 762-3327
 Computerland/Santa Fe (505) 988-8800
 Electronic Parts Co./Albuquerque (505) 293-6161
 Micro Waves Computer Store/Albuquerque (505) 883-0955
 Computer Tech Assoc./Las Cruces (915) 533-2108

NEW YORK

Computer Center/New York (212) 889-8130
 Computer Discount Services/New York (212) 757-8698
 The Computer Edge/Mt. Kisco (212) 664-3212

Computer Era/New York	(212) 860-0500	Employee's Assoc. Bookstore/Okla. City	(405) 686-4295	Northwest Newstand/Houston	(713) 681-7310
Computerland	(212) 840-3223	High Technology Retail/Okla. City	(405) 528-8008	Waghalter Books/Houston	(713) 627-9970
Computerland of Little Neck	(212) 423-5280	Micro Age Computer/Okla. City	(405) 728-1837	Westheimer Newstand/Houston	(713) 781-7793
Comtek/Brooklyn	(212) 332-5933	Computer Store/Tulsa	(918) 224-5347	The Xerox Store/Houston	(713) 972-1791
Comtek/Staten Island	(212) 698-7050	Computerland/Tulsa	(918) 481-0332	The Xerox Store/Houston	(713) 654-8913
Datel Sys./New York	(212) 921-0110	OREGON		The Xerox Store/Richardson	To Come
Harcourt Brace Bookstore/New York	(212) 888-3333	Byte Shop/Beaverton	(503) 644-2686	Young Electrs./College Station	(713) 693-8080
Leigh's Computer World/New York	(212) 879-6257	Computer Solutions/Eugene	(503) 689-9677	Agriplex Computers/Lubbock	(806) 797-4495
Magazine Emporium/New York	(212) 864-0500	Computer Specialties/Salem	(503) 399-0534	Computerland/Waco	(817) 776-6700
Majority New Dist./New York	(212) 243-7770	Computer Store/Corvallis	(503) 754-0811	Computer Port/Arlington	(817) 469-1502
Papyrus Books/New York	(212) 864-8862	Computerland/Portland	(503) 620-6170	Computer Pro/Ft. Worth	(817) 654-3360
Programs Unlimited of Smithaven	(to come)	C 2 E	(503) 245-9785	Heathkit	(817) 737-8822
R D International Co./LI City	(212) 307-0266	Fifth Avenue News/Portland	(503) 222-7462	Waco Comm.	(817) 772-8550
Super Business Machines/New York	(212) 964-6666	Micro Age Computer Store/Portland	(503) 256-4713	Computer Tech Assoc./El Paso	(915) 533-2108
Computerland/Massina	(315) 769-9971	New Day Computing/Portland	(503) 223-8033	Computer West	(915) 655-3391
Computers Etc./Syracuse	(315) 446-6502	Rich Cigar Store/Portland	(503) 228-1700	UTAH	
Radio World, Inc./Oriskany	(516) 736-0184	PENNSYLVANIA		Computerland/Orem	(801) 224-2608
Berliner Computer Ctr./New Hyde Pk.	(516) 775-4700	A B Computers/Montgomeryville	(215) 822-7727	Computerland/Salt Lake	(801) 364-4416
Computer Headquarters	(516) 698-8636	Computer Forum/Frazer	(215) 296-3474	Quality Technology/Salt Lake City	(801) 521-5040
Computer Microsystems/Manhasset	(516) 627-3640	Computerland/Dresler	(215) 542-8835	VIRGINIA	
Computer Shoppe/Patchogue	(516) 758-6558	Computerland/Lancaster	(215) 436-0422	Computer Store/McLean	(617) 272-0294
Computerland/Little Neck	(516) 887-4747	Computerland/Lehigh Valley	(215) 776-0202	Arlington Electric Wholesale/Arlington	(703) 524-2412
Computerland/Nassau County	(516) 742-2262	Computerland/Paoli	(215) 296-0210	Computer Place	(703) 982-3661
Data Scan Comp. Sys./Farmingville	(516) 698-6285	The Computer Source/W. Reading	(215) 375-4231	Computers Plus/Alexandria	(703) 971-1996
Future Visions Computer/Melville	(516) 423-7820	Doc's Computer Supply Center/Ardmore	(215) 642-6550	Computerland	(703) 491-4151
Harrison Radio/Farmingdale	(516) 293-7990	Drexel University Book Store	(215) 895-2000	Computerland/Tyson's Corner	(703) 893-0424
Heathkit Electrs./Jericho	(516) 334-8181	Heathkit Electr. Ctr./Frazer	(215) 288-0180	H.B. Computer Ctr.	(703) 295-1975
Programs Unlimited/Jericho	(516) 997-8668	Heathkit Electr. Ctr./Philadelphia	(215) 647-5555	Heathkit Electrs.	(703) 765-5515
Spartan Electrs/Commack	(516) 499-9500	Main Line Computer Center/Wayne	(215) 687-8500	Home Computer Ctr./Newport News	(703) 595-1955
Syosset Video & Electrs./Syosset	(516) 921-5454	Marketline Sys./Huntington Valley	(215) 947-6670	Program Store/Falls Church	(703) 536-5404
Castle Computers/Latham	(518) 783-9405	Micro Computer Center/Media	(215) 565-1380	Virginia Micro Sys./Woodbridge	(703) 491-6502
Computer Room/Albany	(518) 869-3818	Mighty Byte Computer Ctr./Horsham	(215) 443-9020	V.P.I. Facilities/Blacksburg	(703) 961-5991
Future Distribution/Mogers	(518) 561-5703	Computer House/Pittsburgh	(412) 921-1333	The Xerox Store/Fairfax	(703) 591-8845
Lela Computer Suitsors/Albany	(518) 272-2691	Computer Workshope/Monroeville	(412) 823-6722	The Xerox Store/Vienna	(703) 442-9655
Computer Tree/Endwell	(607) 748-1223	Erie Computer Co./Erie	(412) 454-7652	Computerland	(804) 973-5701
Computerland/Ithaca	(607) 277-4888	Pittsburgh Computer Store/Pittsburgh	(412) 391-8050	Computerland/Richmond	(804) 741-3536
Computerland/Johnson City	(607) 277-4888	Computer Store/State College	(717) 272-0294	Data Base/Richmond	(804) 282-1817
Unicorn Electronics/Johnson City	(607) 798-0260	One Step Computer Shoppe	(717) 761-6754	Home Computer Ctr.	(804) 340-1977
Computer Resource/Williamsville	(716) 633-9510	Computerland/Harrisburg	(814) 533-6892	WASHINGTON	
Computerland	(716) 586-0378	RHODE ISLAND		A B C Comm./Seattle	(206) 364-8300
Computerland/Buffalo	(716) 836-6511	Computer City/Providence	(401) 331-2187	Almac-Stroom/Bellevue	(206) 643-9992
Home Computer Ctr./Rochester	(716) 244-6237	Computer Power/Warwick	(401) 738-4477	Amateur Radio Supply Co./Seattle	(206) 767-3222
Micro Age Computer Store/Rochester	(716) 244-9000	Computerland/Providence	(401) 274-5100	Byte Shop/Seattle	(206) 622-7196
Modern Tek Shop, Inc./Snyder	(716) 839-5800	SOUTH CAROLINA		Central Computers/Bellevue	(206) 746-5227
Readout Computers/Buffalo	(716) 634-9354	Colsmo Comm/Rockhill	(803) 366-7157	City News/Bellevue	(206) 455-9683
All Things Computer/Scarsdale	(914) 723-6262	Computerland/Anderson	(803) 224-5428	Computer & Video Ctr./Vancouver	(206) 695-1540
Computer Corner/White Plains	(914) 949-3282	SOUTH DAKOTA		Computerland	(206) 581-0388
Computer Store/White Plains	(914) 428-1661	Computerland/Rapid City	(605) 348-5384	Data-Borne Computers/Renton	(206) 248-0101
Heathkit/N. White Plains	(914) 761-7690	Computerland/Sioux Falls	(605) 338-5263	Empire Electrs./Seattle	(206) 244-5200
Mr. Computer/Wappinger Falls	(914) 297-1223	TENNESSEE		Heathkit	(206) 682-2172
Mr. Oz News Center Book Store/		Campus Computers/Nashville	(615) 327-9123	Heathkit	(206) 246-5357
New City	(914) 638-0990	Chattanooga Computer Ctr.	(615) 892-7038	Omega Computers/Bellevue	(206) 455-1138
Programs Unlimited/White Plains	(914) 761-9283	Computerland/Knoxville	(615) 693-8225	Omega Computers/Seattle	(206) 522-0220
NORTH CAROLINA		Eastern Micro Computer/Knoxville	(615) 594-8365	Omega Computers/Lynnwood	(206) 775-7585
Byte Shop/Charlotte	(704) 568-8100	Rush Elects/Bristol	(615) 764-0831	Swan Computers, Inc./Bellevue	(206) 454-6272
Computer Alternatives/Asheville	(704) 274-5404	Computer Lab/Memphis	(901) 761-4743	Western Micro Computer Ctr.	(206) 676-5585
Computerland/Charlotte	(704) 377-9821	Computerland/Memphis	(901) 767-0233	The Xerox Store/Redmond	(206) 643-2600
K & S Newstand/Winston-Salem	(919) 724-7537	Tobacco Corner/Memphis	(901) 682-3326	The Xerox Store/Tukwila	(206) 575-1212
Liberty News & Beverage/Durham	(919) 493-1180	TEXAS		Alpha Computer Sys./Kennewick	(509) 586-7603
Worldwide News & Specialties/Cary	(919) 467-7130	Compu Shop/Richardson	(214) 783-1252	Personal Computers/Spokane	(509) 534-3955
NORTH DAKOTA		Computer Video Sys./Plano	(214) 423-3654	Rob Roy Computer Shop/Yakima	(509) 575-7704
Computerland/Fargo	(701) 237-3069	Computerland/Longview	(214) 663-3202	WISCONSIN	
Computerland/Grand Forks	(701) 746-0491	Computerland/Richardson	(214) 363-2223	Asmus Electronics/Fond Dulac	(414) 923-4107
OHIO		Computerland/Tyler	(214) 581-7000	Byte Shop/Milwaukee	(414) 281-7004
All Media Material	(216) 678-5499	Simtec/Dallas	(214) 484-3319	Chester Electr. Supply/Kenosha	(414) 658-4616
American Bookstore/New Parma	(216) 888-8210	Software Concepts/Dallas	(214) 458-0330	Computerland of Ozaukee	(414) 242-9490
Basic Computer Shop	(216) 867-0808	Softwares/Dallas	(214) 644-5043	Computers Unlimited/Milwaukee	(414) 355-5206
Cleveland Computer Co.	(216) 946-1722	Computer 'N' Things/Austin	(512) 453-5970	Computerworld/Appleton	(414) 733-9547
Computer Warehouse/Euclid	(216) 481-1600	Computer Shop/San Antonio	(512) 828-0553	Digital Den/Wauwatosa	(414) 475-6020
Computerland/Akron-Canton	(216) 493-7786	Computer Solutions/San Antonio	(512) 341-8851	Four J's/Milwaukee	(414) 466-8990
Computerland/Warren	(216) 544-4191	Computer To-Go/Austin	(512) 472-8926	North Shore Computers	(414) 963-9700
The Corner Store/Median	(216) 722-2777	Computerland	(512) 724-1551	Prospect News/Milwaukee	(414) 276-6110
Cosmic Comics/Cleveland	(216) 784-3449	Computerland/Austin	(512) 452-5701	American Computer Sys./Madison	(608) 257-1348
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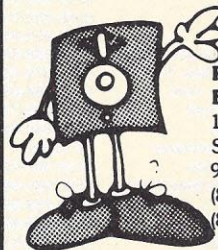
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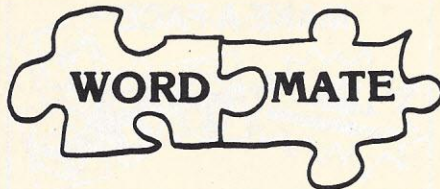
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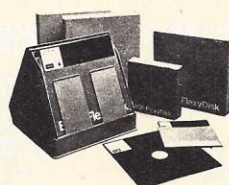
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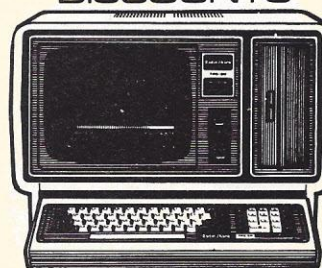
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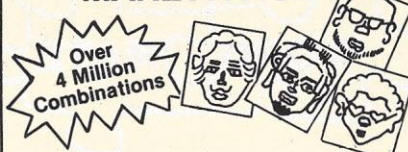
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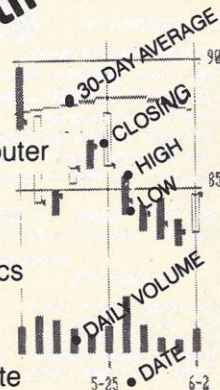
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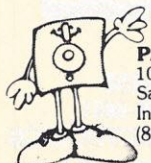
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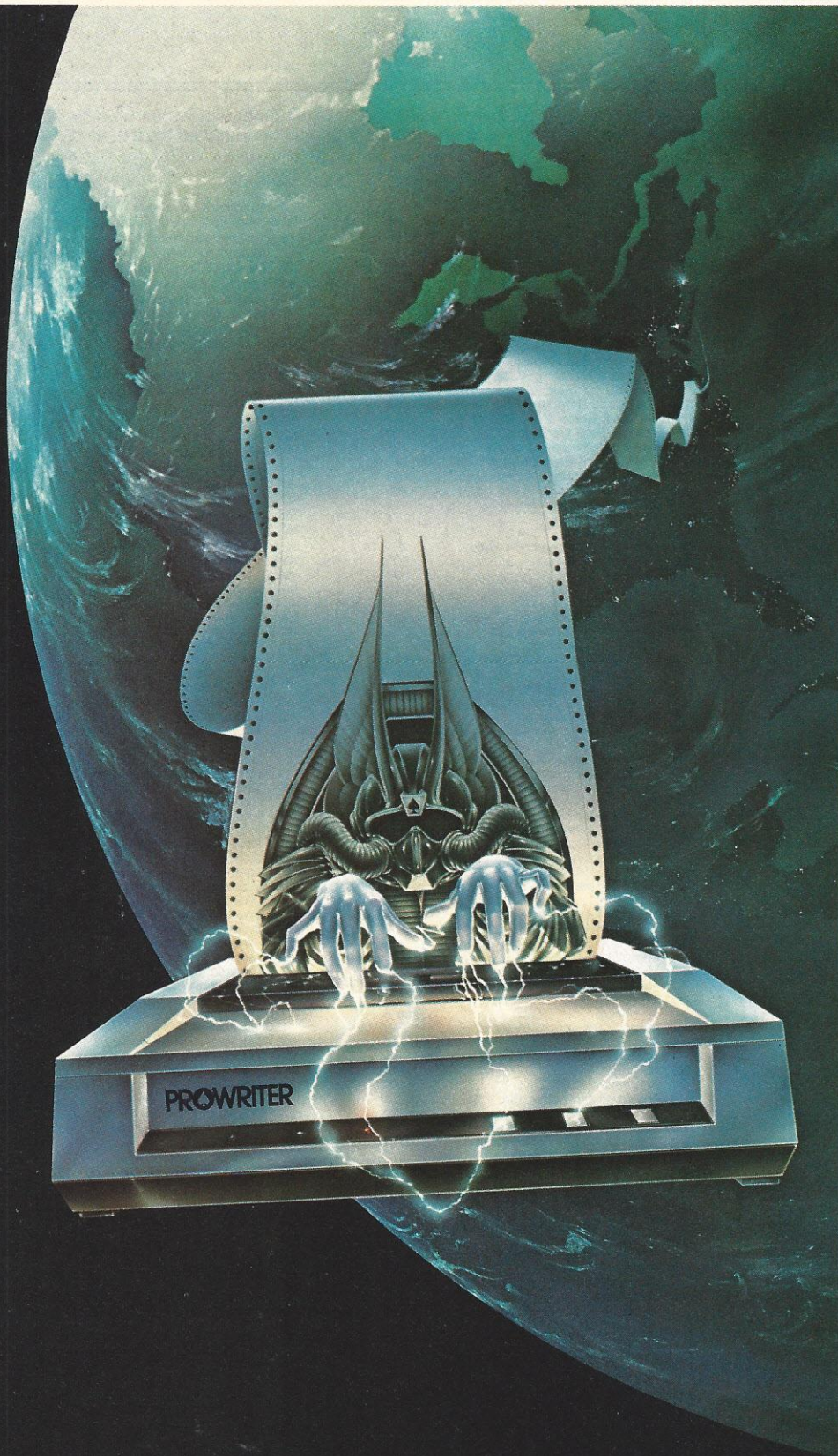
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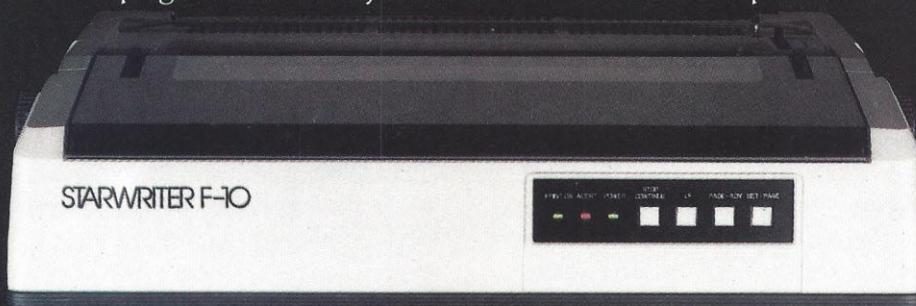
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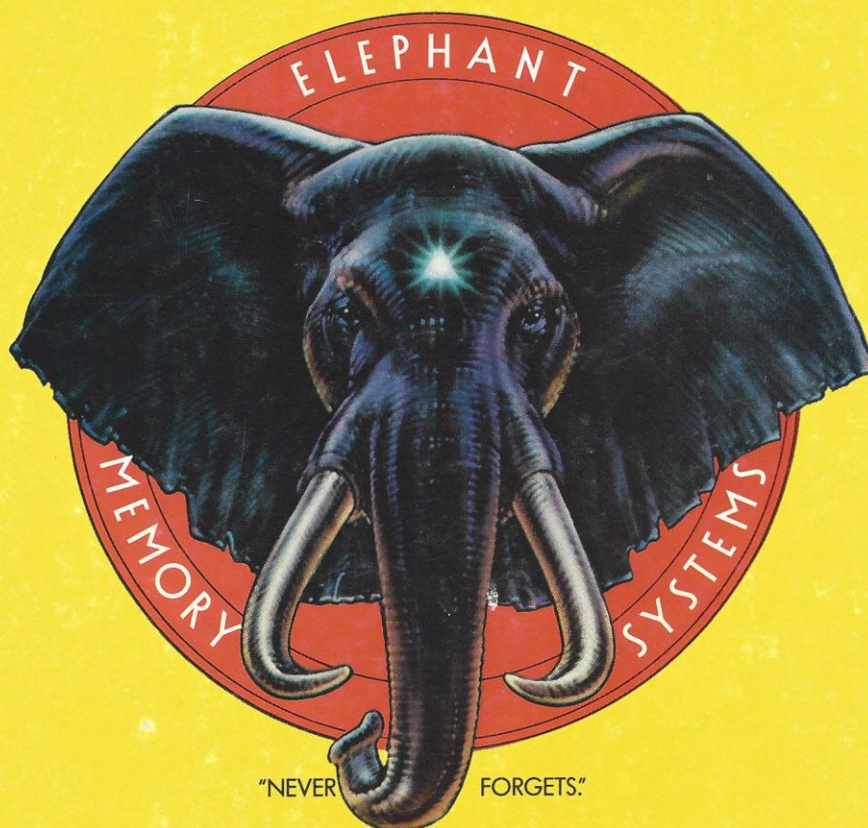
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